AIC

Storage Solution Group

XD1100 Series
1U 10-Bay RBOD
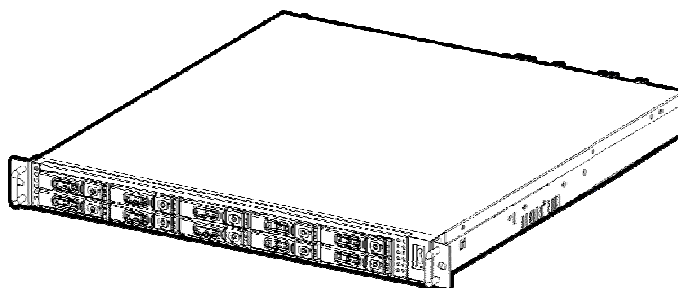
User's Manual

Model	Description
SSG-DRFC41-1102-A1	FC/SAS to SAS/SATA 1U10 Single Expander RBOD
SSG-DRSA11-1102-A1	SAS to SAS/SATA 1U10 Single Expander RBOD

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FCC Compliance Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.

Warning:

- A shielded-type power cord is required in order to meet FCC emission limits and also to prevent interference to the nearby radio and television reception. It is essential that only the supplied power cord be used.
- Use only shielded cables to connect I/O devices to this equipment.
- You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

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SAFETY PRECAUTIONS

Before getting started, please read the following important cautions:
- All cautions and warnings on the equipment or in the manuals should be noted.
- Most electronic components are sensitive to electrical static discharge, therefore, be sure to ground yourself at all times when installing the internal components.
- Use a grounding wrist strap and place all electronic components in static-shielded devices. Grounding wrist straps can be purchased in any electronic supply store.
- Be sure to turn off the power and then disconnect the power cords from your system before performing any installation or servicing. A sudden surge of power could damage sensitive electronic components.
- Do not open the system's top cover. If opening the cover for maintenance is a must, only a trained technician should do so. Integrated circuits on computer boards are sensitive to static electricity. Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This will help to discharge any static electricity on your body.
- Place this equipment on a reliable surface when install. A drop or fall could cause injury.
- Please keep this equipment from away humidity.
- Carefully mount the equipment into the rack, in such manner, that it won't be hazardous due to uneven mechanical loading.
- Do not leave this equipment in an environment unconditioned, out of operation or storage temperature range may damage the equipment.
- This equipment is to be installed for operation in an environment with maximum ambient temperature below 35°C.
- The openings on the enclosure are for air convection to protect the equipment from overheating. DO NOT COVER THE OPENINGS.
- Never pour any liquid into ventilation openings. This could cause fire or electrical shock.
- Make sure the voltage of the power source is within the specification on the label when connecting the equipment to the power outlet. The current load and output power of loads shall be within the specification.
- This equipment must be connected to reliable grounding before using. Pay special attention to power supplied other than direct connections, e.g. using of power strips.
- Place the power cord out of the way of foot traffic. Do not place anything over the power cord. The power cord must be rated for the product, voltage and current marked on the product's electrical ratings label. The voltage and current rating of the cord should be greater than the voltage and current rating marked on the product.
- If the equipment is not used for a long time, disconnect the equipment from mains to avoid being damaged by transient over-voltage.
- Never open the equipment. For safety reasons, only qualified service personnel should open the equipment.
- If one of the following situations arise, the equipment should be checked by service personnel:

➢ The power cord or plug is damaged.
➢ Liquid has penetrated the equipment.
➢ The equipment has been exposed to moisture.
➢ The equipment does not work well or will not work according to its user manual.
➢ The equipment has been dropped and/or damaged.
➢ The equipment has obvious signs of breakage.
➢ Please disconnect this equipment from the AC outlet before cleaning. Do not use liquid or detergent for cleaning. The use of a moisture sheet or cloth is recommended for cleaning.

Product features and specifications are subject to change without notice.

Document History

Author	Date	Action	Revision
ES	05/06/2009	Initial release, based on 3u16 RBOD manual ver 1.20	1.00
ES	05/26/2009	Added document number, mod key features, part number	1.01
ES	06/05/2009	Modify LED status and alert chapter 5	1.02
ES	07/27/2009	Add Chapter 4.7, modify LAN LED description, FW upload FTP program	1.03
ES	11/09/2009	Changed P/N	1.04
ES	02/09/2010	Add hfs link	1.05

Table of Contents

1.   Introduction

The 1U 10-Bay FC/SAS (Serial Attached SCSI) RBOD (RAID of Bunch Of Disks) is a high performance, high density, scalable SAS to SAS/SATA (Serial ATA) and FC (Fibre Channel) to SAS/SATA Disk RAID/Expansion Enclosure. The unit can be cascaded from a SAS/FC server, a SAS/FC Switch, or SAS/FC DAS (Direct Attached Storage) through the integrated expander for maximum storage expansion.

An optional FC mezzanine board is available for application with servers, switches and DAS in Fibre Channel environment.

The RBOD is made up of several modules including single IO modules with intelligent environmental monitoring, 10-port backplane board, power supply modules with integrated fans, LED indicators on the drive carriers and rear display panel, and hot-swappable hard drive canisters.
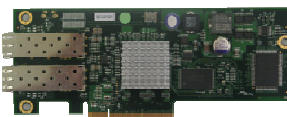
1.1.   Key Features

- Rack-mount 1U Enclosure

- Single FC/SAS Switch Expander Modules

    o   3 wide 4x 3Gb/s SAS Channels per Module

    o   2x 4Gb/s FC Channels per Module

    o   Hot-Swap Redundancy Standard

- 10 High Density 2.5" Drive Trays

    o   3Gb/s SAS Drives

    o   3Gb/s SATA II Drives

- 12V Single Rail 300W Power Supplies

    o   Up to 85% Efficient Power Regulation and Utilization

    o   Auto ranging 100-240 VAC

    o   Integrated I2C Management & Control

    o   Integrated Fan with Fan Speed Control

    o   Integrated Temperature Monitoring

    o   DC Voltage Monitor

    o   DC Current and Load Monitor

    o   On/Off via I2C or Control Signal

- Cableless Design

- SES Configuration and Management

- Serial Command Line Management

1.2. System Components

Before removing the subsystem from the shipping carton, visually inspect the physical condition of the shipping carton. Exterior damage to the shipping carton may indicate that the contents of the carton are damaged. If any damage is found, do not remove the components; contact the dealer where the subsystem was purchased for further instructions. Before continuing, first unpack the subsystem and verify that the contents of the shipping carton are all there and in good condition.

Your new 1U 10-Bay RBOD includes:

Item#	Description	Image	Quantity
1	Enclosure Chassis		1
2	2.5" SATA Drive Tray		10
3	FC/SAS IO Module		1
4	300W AC/DC PSU Modules		2
5	Printed Quick Start Guide		1
6	Manual and Utility CD		1
7	Power Cable (US or EU)		2
8	Serial cable		1

Item#	Description	Image	Quantity
9	M3 0.5Px4mm countersunk flathead screw set for mounting drives in drive trays		1 set
10	Bracket Set for Rack Mounting		1 set
11	FC Mezzanine Board		Optional
12	SAS cable or FC cable		Optional

If any items are missing, please contact your authorized reseller or sales representative
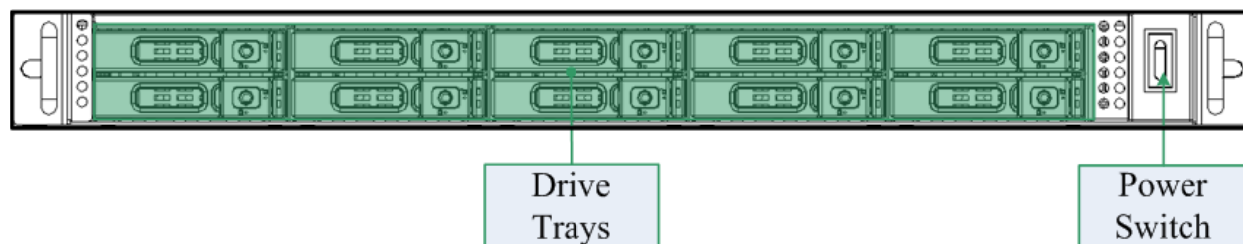
1.2.1. Front Panel

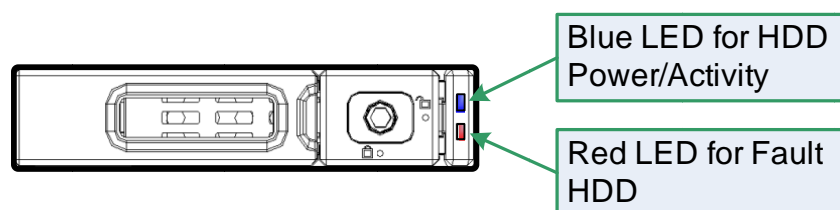*Figure 1.1: 1U10 RAID Front Side*

1.2.2. Drive Carrier

Figure 1.2: 1U10 RAID Drive Tray
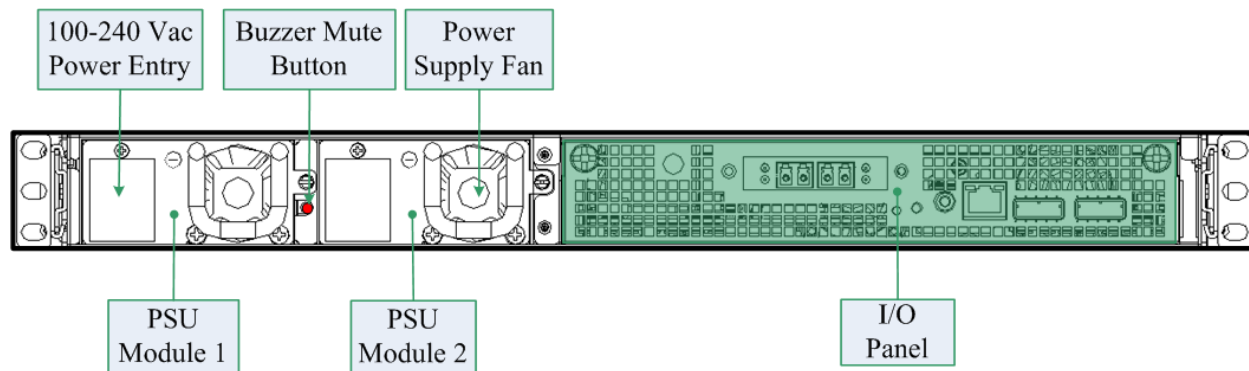
1.2.3. Rear Panel

Figure 1.3: 1U10 RAID Rear Side

1.2.4. IO Module

The system is equipped with single FC/SAS Expander and RAID module. The FC/SAS Expander is a fully configurable FC/SAS switch with two 4x 3Gb/sec wide SAS ports for a total of 1200MB/sec per channel or 2400MB/sec full duplex; and two 4Gb/s FC ports. The module has a serial port to access the menu configuration and monitoring system.
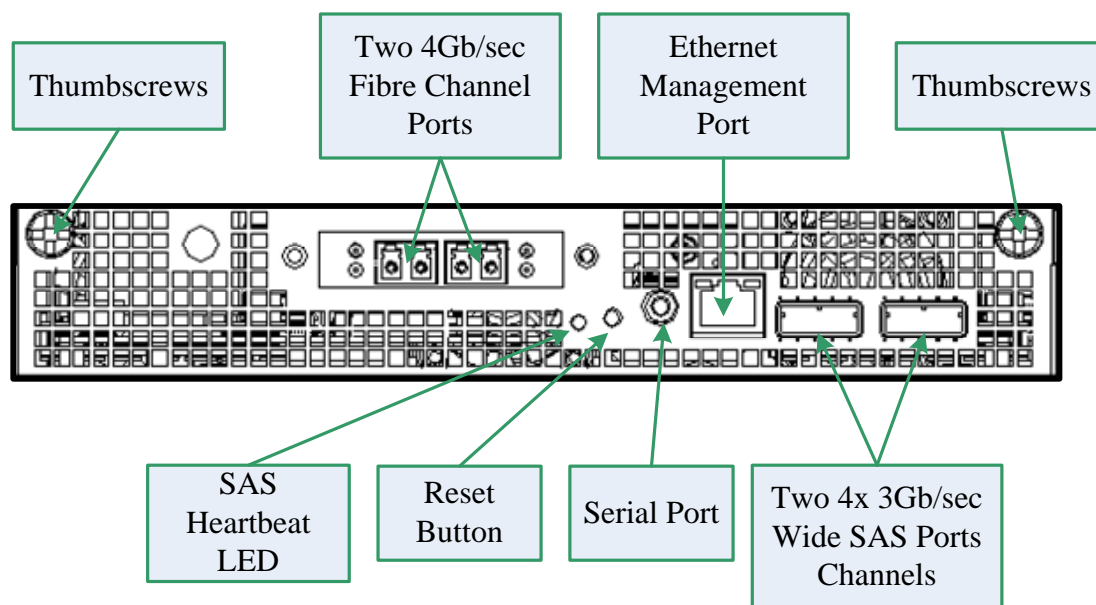

Figure 1.4: 1U10 RAID IO Module

1.2.5. PSU Module

The system comes with 2 Intelligent PSU Modules described below.

- Universal AC PSU
- ROHS Compliant
- 12V Single Rail 100-240V 47-63Hz 4.5-2A
- Integrated Fan
- Integrated I2C management IC
- Fan Speed Measurement and Control
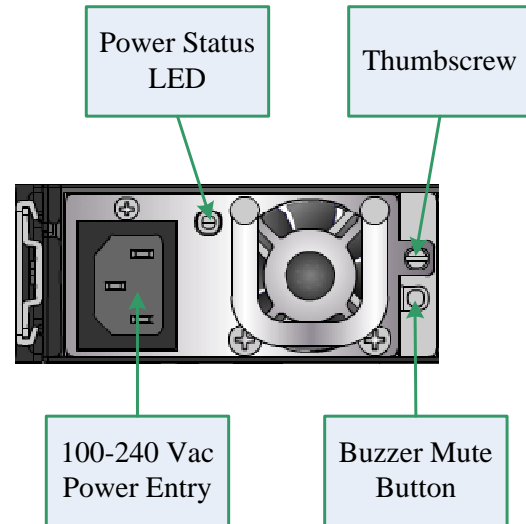- DC Output 300W Max 12V@24A, +5VSB@0-2.5A

Power Status LED | Thumbscrew

100-240 Vac Power Entry | Buzzer Mute Button

Figure 1.5: 1U10 RAID PS Module

2. Hardware Setup

This chapter provides detailed instructions on hardware setup and installation. Installation involves mounting the system in a rack, installing disk drives, connecting to an external host or FC/SAS switch, and optionally connecting to additional enclosures. Installation into a rack enclosure should be performed prior to installing drive trays with disk drives. A set of mounting brackets with screws and assembly guide is provided with the system to allow easy installation in a variety of different 19" rack enclosures. Follow the instructions provided by the rack supplier for proper rack installation. Open and inspect all system components as listed in 1.2 before proceeding with installation.

Note: Please read all instructions prior to attempting installation. Follow these instructions carefully to avoid damage or improper operation.

Warning: Electro-Static Discharge, ESD, can damage the hard drives and other electronic elements of the system without exhibiting physical signs of damage. Proper grounding and protective steps should be employed when handling any ESD sensitive materials or devices. Failure to follow proper ESD protective procedures may result in equipment damage or failure. Simple tests may be used to determine whether equipment damage is the result of ESD or other electrical short circuit. Damage sustained resulting from ESD is not covered under the warranty.

2.1. Handling and Safety Precautions

2.1.1. System Precautions

☑ The system can weigh in excess of 40 lbs without drives installed. It is recommended that 2 or 3 people be involved in lifting the enclosure and, if desired, installing it in a rack enclosure.

☑ Prior to operation make sure all drive trays are installed in the enclosure regardless of whether they contain disk drives. Drive trays must be present to insure proper airflow and cooling through the system

☑ The system requires open space front, minimum 3", and rear, 3", to allow airflow for cooling.

☑ The system requires reliable AC power, either 100-120 or 210-240 VAC, for proper operation. All power suppliers should be connected to properly grounded AC power source(s).

☑ Secure all modules and drive trays as described in the instructions. Loose or unsecured components can result in system damage or personal injury.

☑ Make sure to retain packing materials and cartons for possible re-packing prior to transporting or shipping the system. Do NOT ship system with drives installed.

2.1.2. Static Precautions

☑ Static Electricity can damage the system components and drives without physical sign of damage. Use proper ESD protection measures when handling any electronic components.

☑ Discharge static electricity by using an anti-static strap. If a strap is not available discharge but touching a grounded metal object like the enclosure chassis if the PSU is connected to a properly grounded power source.

☑ Avoid plastics unless they are anti-static material.

☑ Avoid carpets, vinyl, and Styrofoam in the work area or from coming in contact with the enclosure.

☑ Handle all modules by their handles or metal trays. Avoid touching components or printed circuit boards.

2.2. Drive Installation Options

This section describes the drive tray configuration options.

The 1U10 supports both SAS and SATA drives with the following options.

Item	Drive Tray Configuration Options	Image
1	2.5" SAS/SATA Drive Carrier Accepts native SAS drives and single port access to SATA II drives.	
2	2.5" Dummy Carrier No drive mounting screw holes.	

SAS

2.3. Removing a drive tray and installing a hard drive

This section describes the procedure to remove a drive carrier, install a hard drive, and replace the carriers in the enclosure.

Please note: Use proper ESD protective measures when handling disk drives.

Figure 2.1: Opening 1U 10-Bay RBOD Drive Tray

2.3.1. Removing a Disk Drive

1) Release the handle mechanism by gently but firmly press release latch 1. Handle lever 2 should pop out slightly indicating the locking mechanism has been released.

2) Rotate handle 2 outward to disengage the drive carrier. The handle acts as a cam to disengage the carrier from the backplane. If a drive(s) is present and the system is powered on, retract the carrier a few inches to disconnect from the backplane. Allow a minute for the drive(s) to spin down prior to removal from the system.

3) Fully retract and remove the carrier from the enclosure.

4) If a drive(s) is present the needs to be replaced, remove it by unscrewing the mounting screws, sliding the drive toward the front of the tray to disengage it from the interposer board, and gently lifting the drive out of the carrier.

2.3.2. Installing a Disk Drive

1) Unpack and remove any packing materials and interface covers from the replacement hard drive.

2) Place the drive in the carrier position and slide toward the rear firmly seating the drive to the interposer board.

3) Secure the drive using four (4) of the M3 0.5Px4mm countersunk flathead drive-mounting screws provided.

Figure 2.2: 1U 10-Bay RBOD Drive Screw Locations

Warning: Properly securing the drives is required for proper system operation. Unsecured drives may exhibit a variety of behaviors including sporadic or intermittent operation, shortened drive life, and outright failure.

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4) Replace the drive tray in the enclosure slot. Slide into the system until the carrier engages the backplane.

5) Push latch 1 home to fully engage the drive. Handle 2 will rotate inward and engage with Latch 1 and a click sound indicates the latch is secured.

6) After a moment the LED indicator should light indicating the drive has power and is beginning initialization and spin up.

7) Allow a minute or two for the initialization process to complete. The LED should show constant blue indicating normal inactive status or flashing blue if activity is present. If the LED indicates red or does not illuminate:

    a. Inspect the drive for proper installation. Reinsert the drive carrier to ensure proper connection.

    b. If the symptom persists, follow the procedure in above step 1 to remove the drive tray, inspect for proper drive installation within the tray and mating with the interposer board, and if necessary, remove and test the drive to validate it is independent of the tray and enclosure.

Warning: Electro-Static Discharge, ESD, can damage the hard drive and other electronic elements of the system without exhibiting physical signs of damage. Proper grounding and protective steps should be employed when handling any ESD sensitive materials or devices. Failure to follow proper ESD protective procedures may result in equipment damage or failure.

Warning: Handle hard drives with extreme care. Dropping the hard drive or touching the components on the circuit board may damage the hard drive without exhibiting physical signs of damage. Use only the mounting screws supplied with the system. Using larger screws may damage the drive.

Warning: All drive trays must be installed regardless of whether they contain drives prior to system operation. Drive trays in each of the drive tray slots insure proper air flow for cooling the system. Prolonged operation with empty slots may result in overheating and resultant damage to drives or system components.

2.3.3. Enclosure Slot Mapping

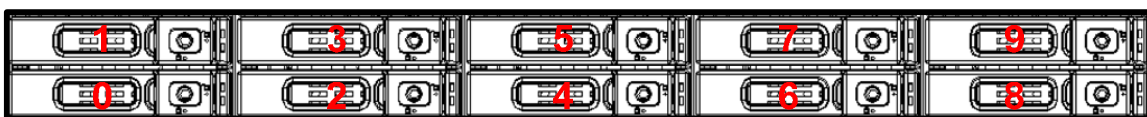The map below shows physical locations and slot order in the enclosure.

Figure 2.3: 1U 10-Bay RBOD Slot Mapping

2.4. Removing and Installing an IO Module

This section describes removing and installing a FC/SAS IO Module.

2.4.1. Removing an IO Module

1) Remove any external cables connected to the module.

2) Turn the thumbscrews counterclockwise and pull out to release the IO module tray and then pull gently.

3) Pull module firmly until it clears the enclosure chassis and place in anti-static bag or container prior to storage or shipment.

2.4.2. Installing an IO Module

1) Remove any packing material and cover.

2) Align the IO module tray with the opening in the rear of the enclosure. Slide in until module connector engages mating connector on backplane.

3) Firmly seat the module and backplane connectors until handle is fully latched and lock the thumbscrews.

4) Connect cables to expander. If system is operational during installation, the Expander will self test and begin FC/SAS link initialization.

Warning: Electro-Static Discharge, ESD, can damage the Expander and other electronic elements of the system without exhibiting physical signs of damage. Proper grounding and protective steps should be employed when handling any ESD sensitive materials or devices. Handle Expander Tray. Avoid touching expander board or components. Failure to follow proper ESD protective procedures may result in equipment damage or failure.

2.5. Removing and Installing a PSU Module

This section describes removing and installing a PSU Module.

Power Status LED

Thumbscrew

100-240 Vac Power Entry

Buzzer Mute Button
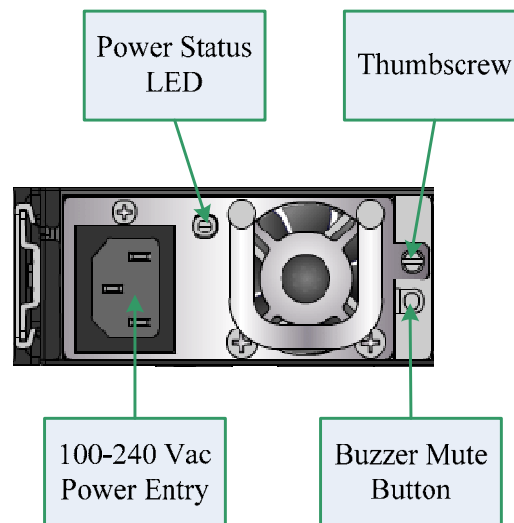
Figure 2.4: 1U 10-Bay RBOD PSU

2.5.1. Removing a PSU Module

1) Remove any power cables connected to the PSU module.

2) Allow a minute for fan to spin down.

3) Loosen PSU module retaining thumbscrew.

4) Grab the handle and gently pull the PSU module out of the slot until it clears the chassis.

5) Place in anti-static bag or container prior to storage or shipment.

2.5.2. Installing a PSU Module

1) Remove any packing material and cover.

2) Hold the PSU module and align it with the slot opening in the rear of the enclosure. Slide in until PSU is fully engaged.

3) Secure PSU module retaining thumbscrew.

4) Connect AC power cable to Module. If system is operational during installation, the PSU module will self test and fan will begin operation. LEDs will reflect status.

2.6.   External Connections

2.6.1. Single Host to Enclosure Connection

A single Server may be easily connected to a wide SAS channel on the Expander using the SAS/FC cable (available separately). The figure below illustrates a typical connection.
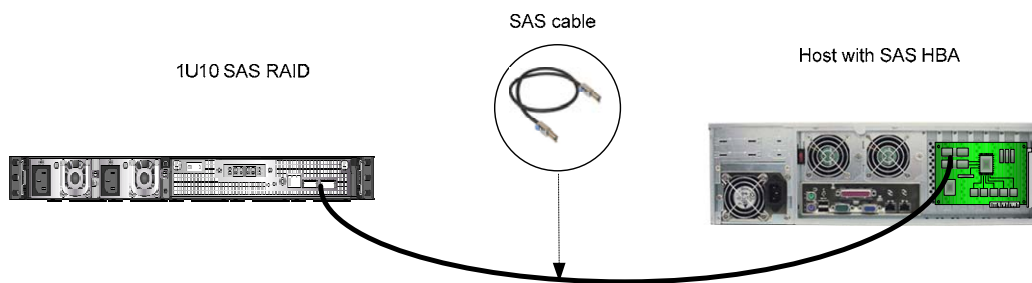
Figure 2.5: 1U 10-Bay RBOD connected to host

2.6.2. Multiple Host to Enclosure Connections

The system may be connected to multiple servers via direct attachment to the Expander Channels or by using a SAS switch. The expanders may be used to optimize operation in multi-host configurations.
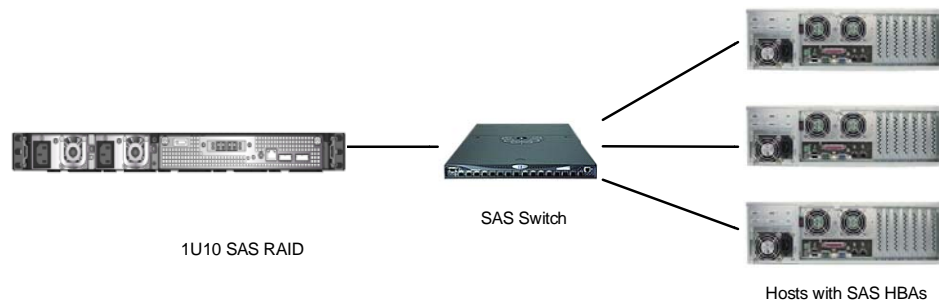
Figure 2.6: SAS fabric with multiple servers connected via a SAS switch to the 1U10 Expander

2.6.3. Multiple Enclosure Connections

Single or Dual configurations may be expanded by daisy chaining from Expander to Expander using optional SAS to SAS cables. Up to 8 systems may be cascaded depending on the limitations of the HBA used with the 1U10. Consult the user manual from the HBA supplier for details particular to that unit.
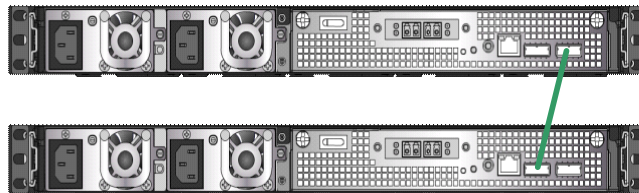

Figure 2.7: Two 1U 10-Bay Enclosures cascaded using optional SAS to SAS cables

2.7. Rack-mount Installation

Should 1U 10-Bay NAS/iSCSI unit need to be installed in the rack, please use the rack-mounting bracket included in the package.

Please follow the step below to install the unit to the rack:

- Install the base metals with 2 screws below on each side of the chassis.

  Use M4 x 4.0L round head Phillips screws to secure the base metals (A)
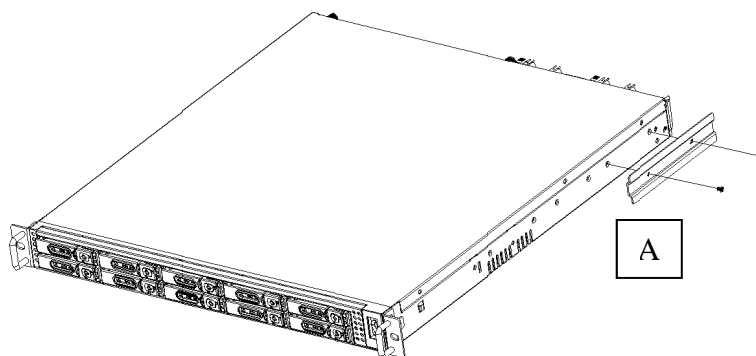
- Install slide rail to the back of the rack cabinet with M5 x 15.0L round head screws and supporting metal (B) below
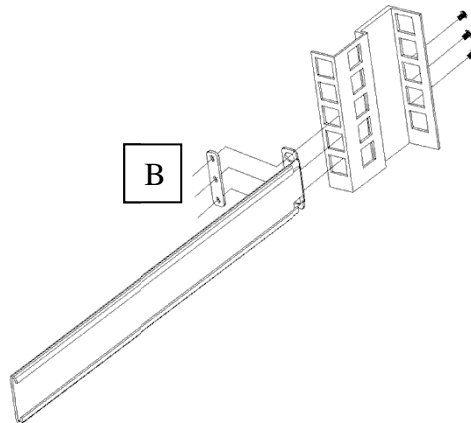
- Slide the chassis onto the slide rail
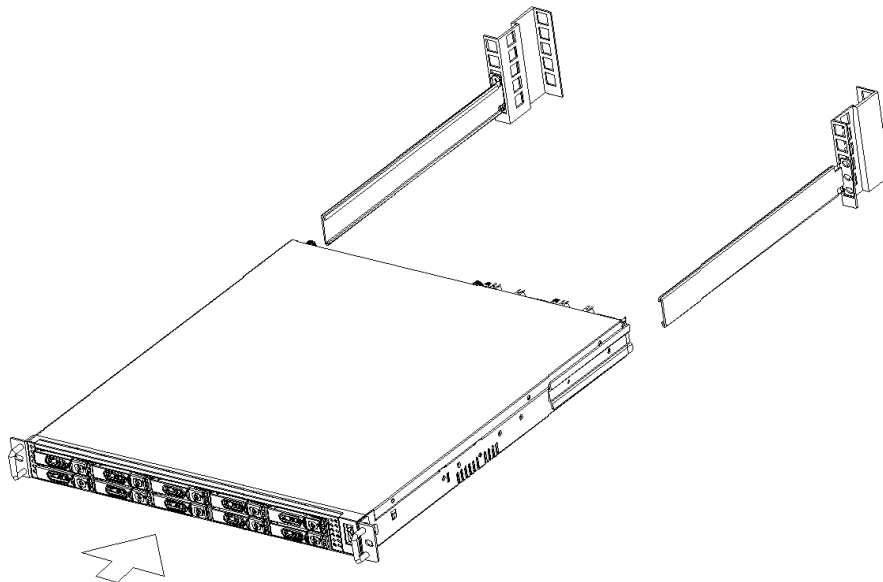
- Secure the chassis by M5 x 15.0L round head applying screws in the front of the unit to the rack

3.   Powering On and Off the System

Preparing to Power On

Prior to powering on the system you will need to have completed the following:

- ☑ Enclosure is installed in rack, if rack mount operation is planned.

- ☑ Hard drives are properly installed and secured.

- ☑ All drive trays are installed and secured.

☑ All external cables are properly connected and secured.

☑ Power cables are installed.

☑ Power from a suitable power source

☑ The system should have been in place long enough to adjust to ambient temperature.

Warning: The system has 2 hot swap auto-ranging power supplies. These should be connected to suitable grounded 100-120V or 210-240V AC power sources. It is recommended separate power sources or rails be used for maximum redundancy and reliability.

Warning: The system requires adequate open space front and rear to allow for proper cooling.

3.1.1. Powering On the System

After the 1U10 is mounted in the rack, drive trays inserted, and external connections completed, the system may be powered on using the following steps.

1) If you have not already done so, using the power cords supplied connect the PSU modules to the power source. If the power is on, LED indicators on the Expanders will flash indicating power is present and the System is in standby mode.

2) Power on any network switches in the configuration.

3) Turn on the power switch on the rear panel to power up the system. The fans should come on immediately afterwards and the drives will begin to spin up and initialize.

4) Allow a few minutes for drive initialization to complete prior to powering on Host System or Storage Appliances or Controllers.

5) After completing system configuration proceed to power on external hosts or Storage Appliances and Controllers. It is recommended hosts be powered on last unless the system is being installed into a live/hot environment.

3.1.2. Power On Status

Once the system has been powered on, the Display can be checked to verify proper operation. System monitoring and status information is collected via the internal I^2C bus and is made available via external controllers and management tools via SES.

• Drive LED status will be steady Blue indicating power on idle state or intermittent Blue indicating Drive activity.

• Expander LEDs will be flashing intermittent to indicate activity

3.1.3. Power Off the System

1) Flush and unmount all the volumes, and/or power off all the servers accessing volumes on the system to be powered down, prior to powering down the unit.

2) Press the On/Off button on the rear panel.

3) Allow a few minutes for the drives to spin down.

4.   RAID Configuration

The following steps are used to configure the RAID system.

4.1.   RAID Creation Quick Guide
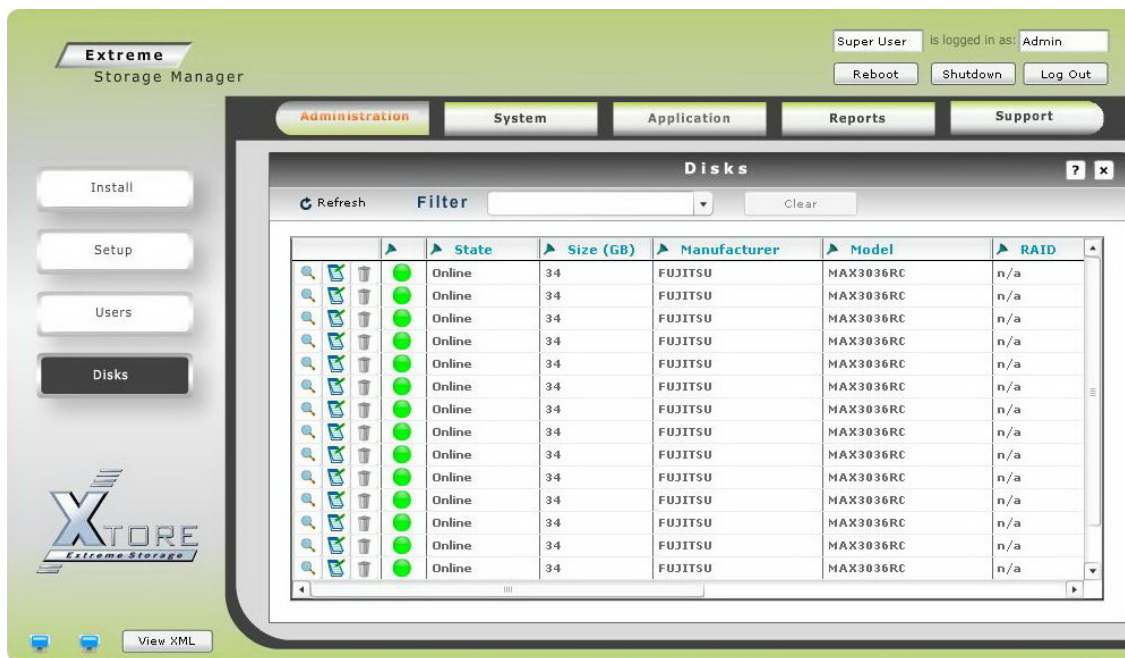
4.1.1. RAID Preparation

Connect an Ethernet cable from 1U10 RBOD Ethernet port to Host. Open a web browser on the host and type in the RBOD's IP address. A GUI will be shown as below.

Log in to the system using the default Super User username and password.


After login, the main screen of the GUI will be displayed.

To check the disk installed, go to "Administration" tab then choose "Disks" from the left column. All the disks will be defaulted to Mission Critical Quality of Service (QoS). There are 3 types of QoS:

- Mission Critical: a QoS setting that is used to categorized drives with high speed performance and high intensive purpose, i.e. SAS drives
- Business: Used by hard drives with medium level intensive purposes.
- Archives: QoS for low intensive resource disk drives, i.e. SATA drives

To change a Quality of Service of a hard drive, click the [icon] button of the selected drive and change the QoS from the drop down menu.
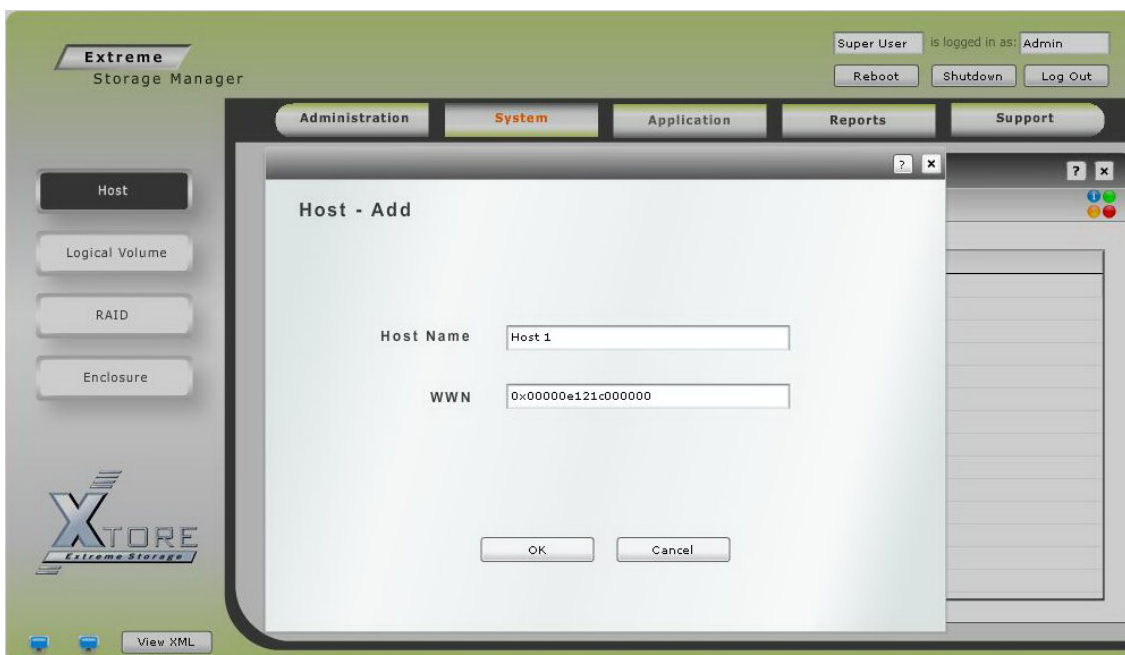
The 1U10 RAID requires having a host listed on the system. The purpose is to allow a host to access the RAID logical volume created. To add a host, go to "System" tab then choose "Host" from the left hand column; then create a host name and specify its WWN.

4.1.2. RAID Addition

1U10 RBOD supports the following RAID level:

- RAID 0: Striped set without parity/Non-Redundant Array.
  It provides improved performance and additional storage but no fault tolerance. It requires a minimum of 2 disks. The capacity of RAID 0 will be roughly $c_1 + c_2 + c_3 + c_4$ …etc, where c_n is the size of each of the drives.

- RAID 1: 1U10 RBOD defines RAID1 as mirrored sets in a striped set. With or without Spare drives. It provides fault tolerance and improved performance.
  It works with either an odd or even number of disks, with a minimum of two disks.
  The capacity of RAID 1 will be roughly $(c \times n)/2$ where is the size of the smallest drive and n is the number of disks.

- RAID 5: Striped set with distributed parity. With or without Spare drives.
  Distributed parity requires all drives but one to be present to operate; drive failure requires replacement, but the array is not destroyed by a single drive failure. It requires a minimum of 3 disks. The capacity of RAID 5 will be roughly $(n-1) \times c$.

- RAID 6: Striped set with dual distributed parity. With or without Spare drives.
  Provides fault tolerance from two drive failures; array continues to operate with up to two failed drives. It requires a minimum of 4 disks. The capacity of RAID 6 will be roughly $(n-2) \times c$.

Note: c is the size of the smallest drive and n is the number of disks.

To create a RAID volume, refer to the steps as follow:
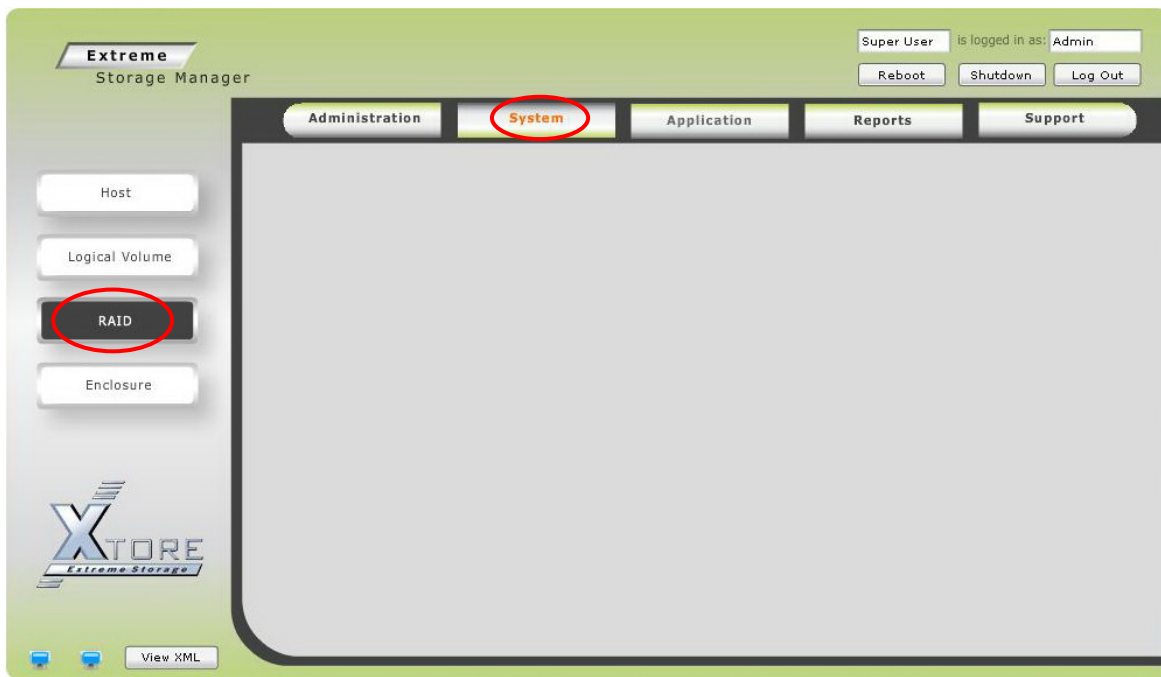
By choosing "System" from the menu bar along the top of the screen and then selecting "RAID" from the bar that appears on the left of the screen, RAID creation screen will be displayed as below.
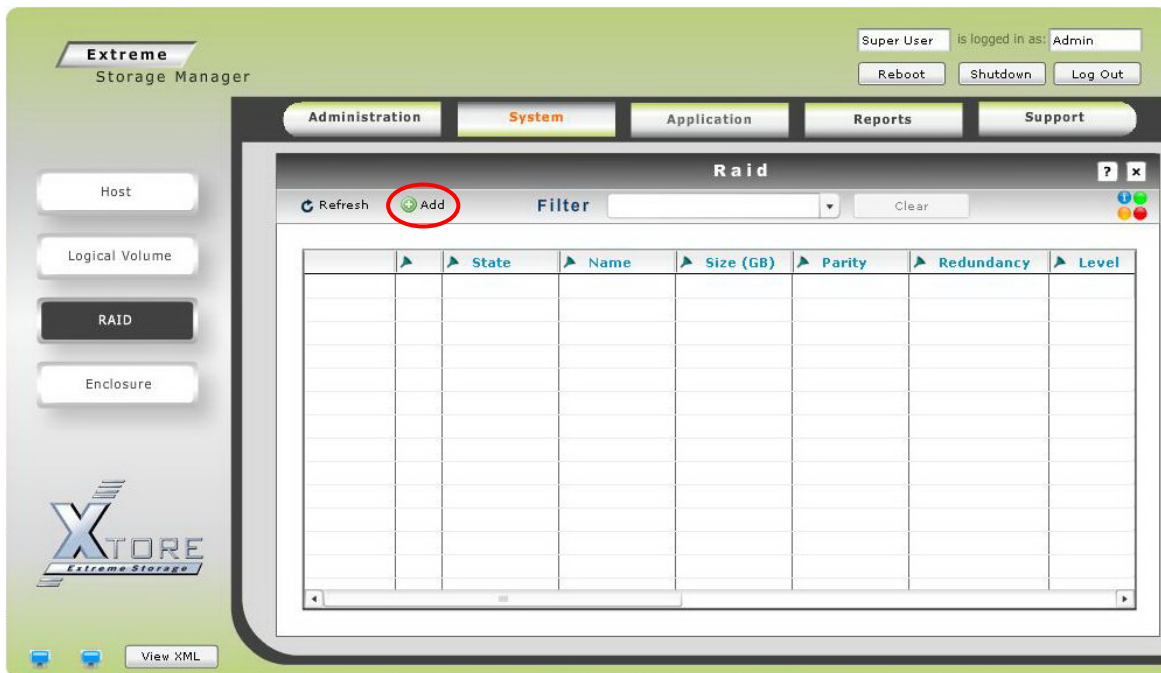
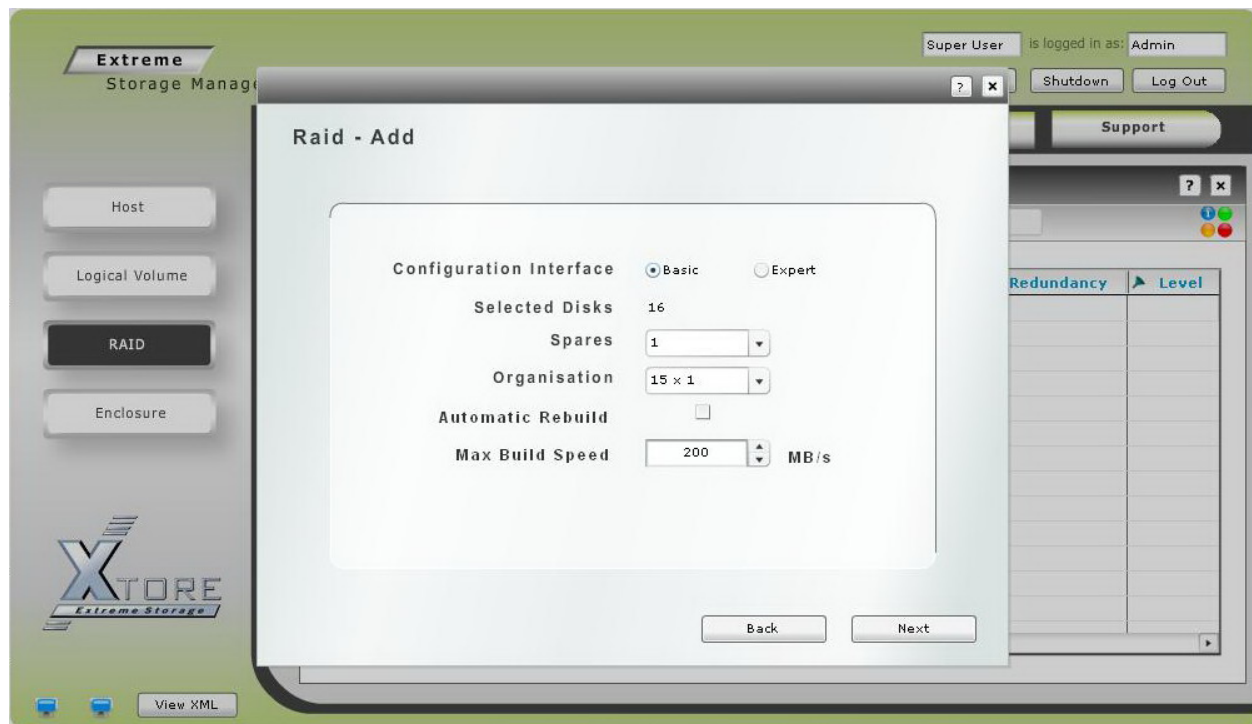To add a new RAID, click on the "Add" button to the left of the data grid.

Input the desired RAID name, RAID level, and other parameters, and click "Next".
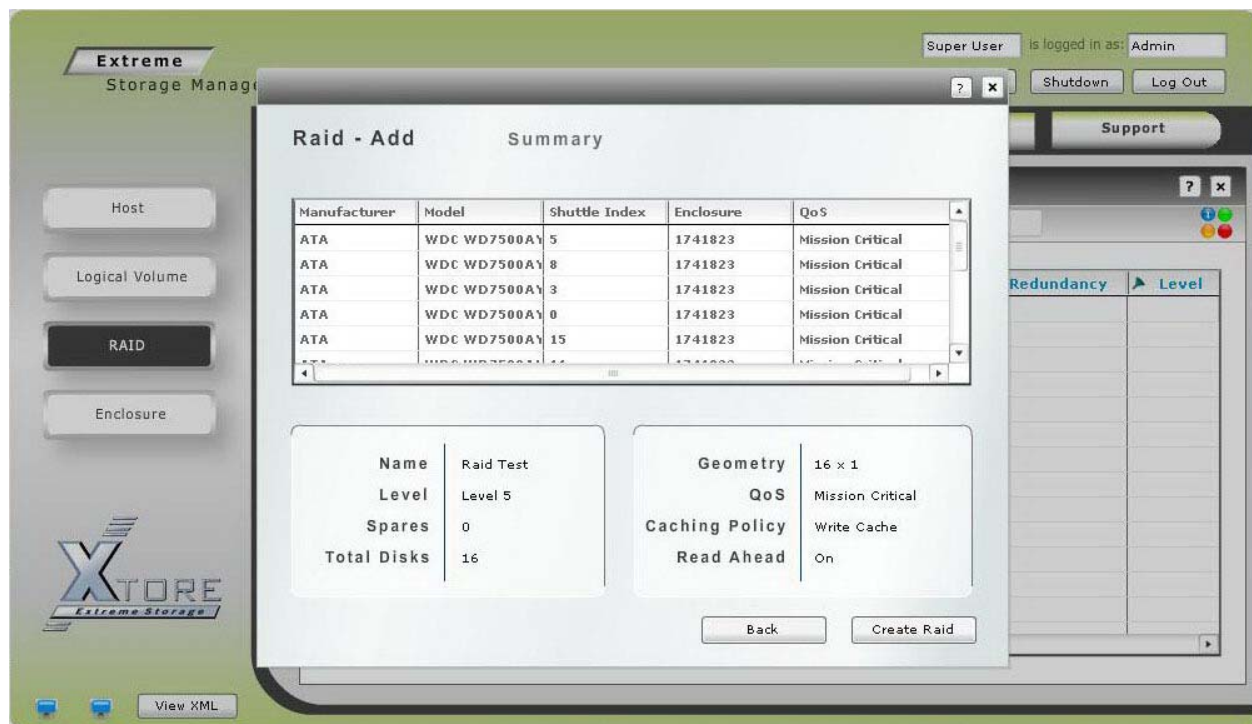Note: RAID will only be able to select drives with the same QoS setting.
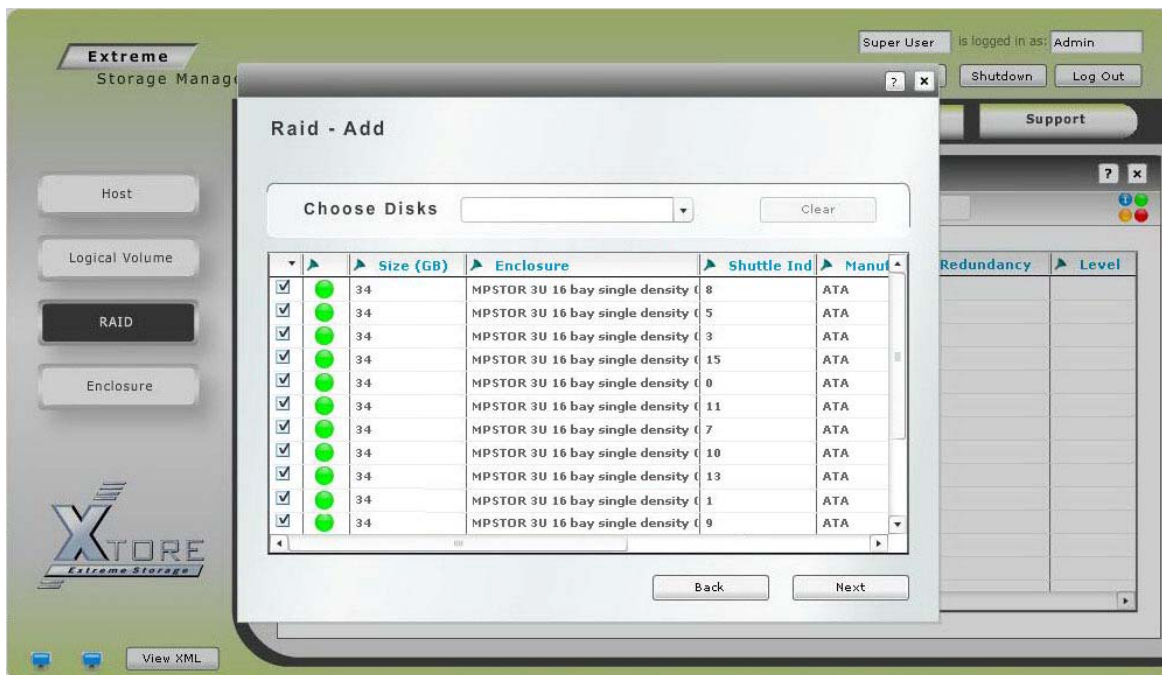
Select the required amount of disks for the RAID. All disks selected must be the same size. Click "Next".

4.1.3. Add Spare Disks

Put aside a number of spare disks taken out from the selected disks (1 out of 16 in the above example) and the RAID geometry.

The above screen is displayed, detailing the disks chosen and all other relevant details of the RAID to be made. Clicking on "Create RAID" will initialize the RAID creation process.

The above screen appears to indicate that the RAID has been created successfully. This also gives the details of the new RAID as well as showing the build progress.
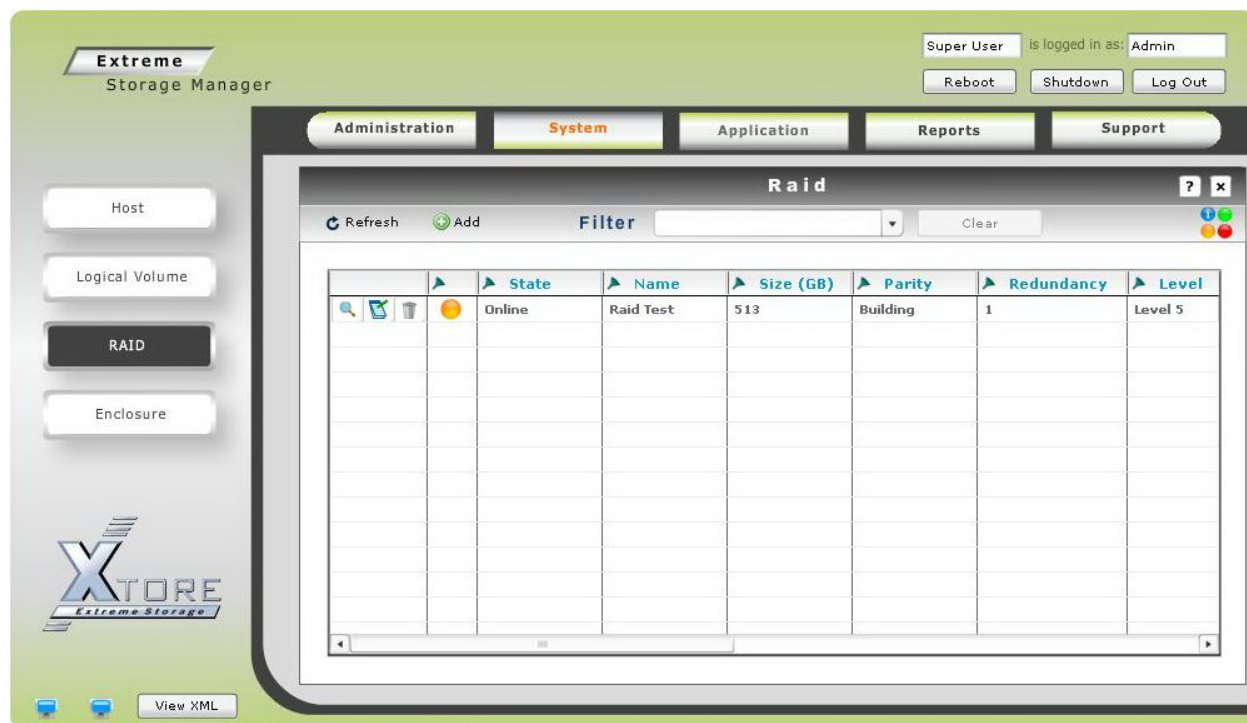
The above screen shows Level 5 RAID in building progress with 16 drives and 513GB in size.

4.1.4. Add Logical Volumes
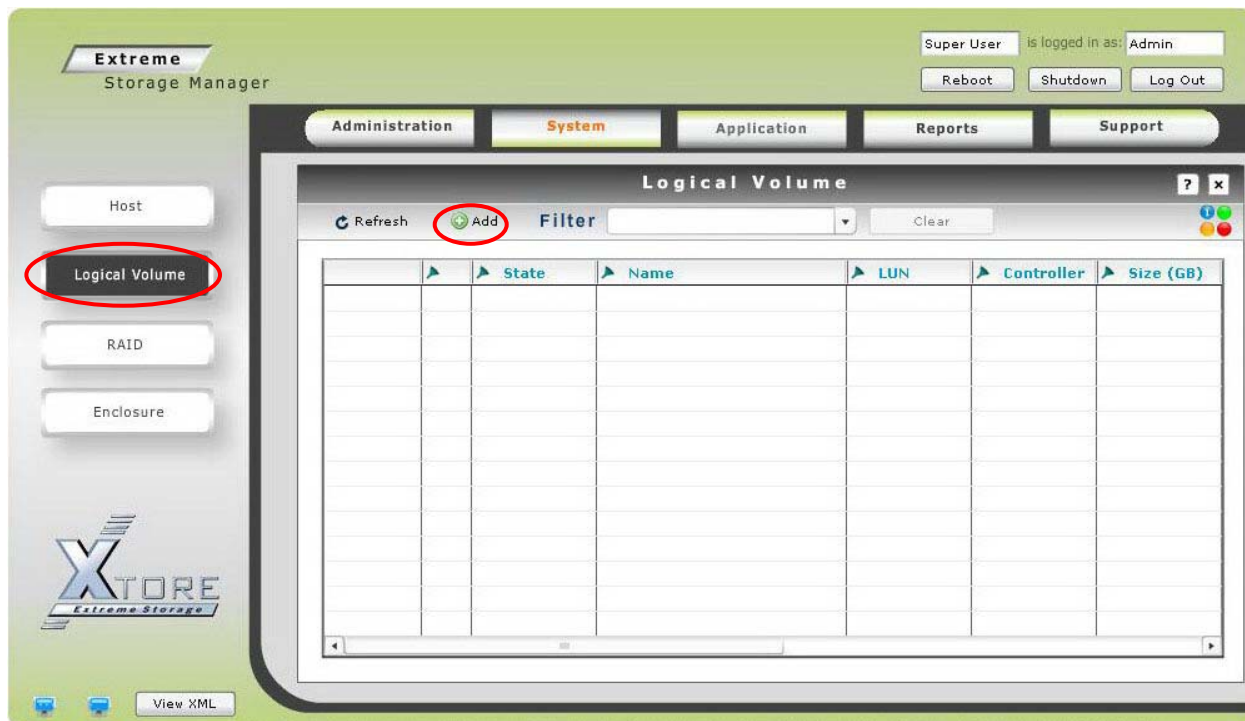
To add a Logical Volume to the system, click on the "Logical Volume" tab on the left of the screen and then on "Add" when the data grid appears.
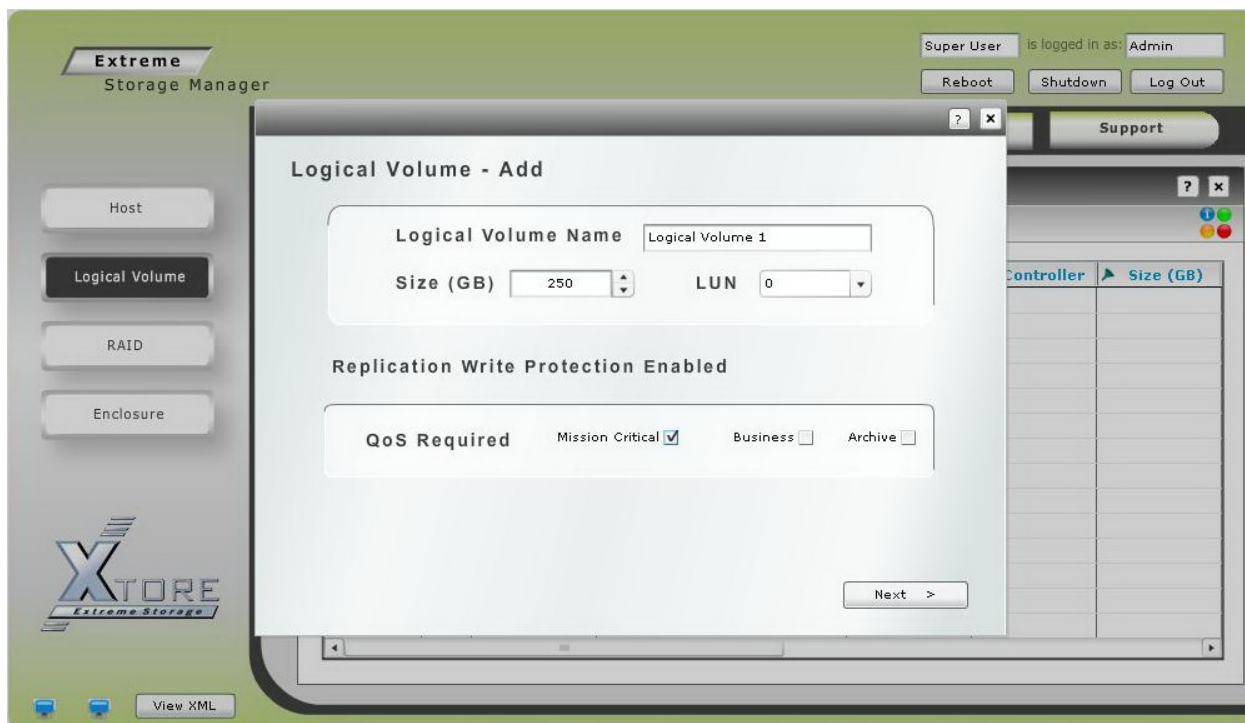
Set the name for the Logical Volume, Size of the logical volume (it should be the same or less than the size of RAID), QoS type (logical volume will only recognize the created RAID array with the same QoS type).
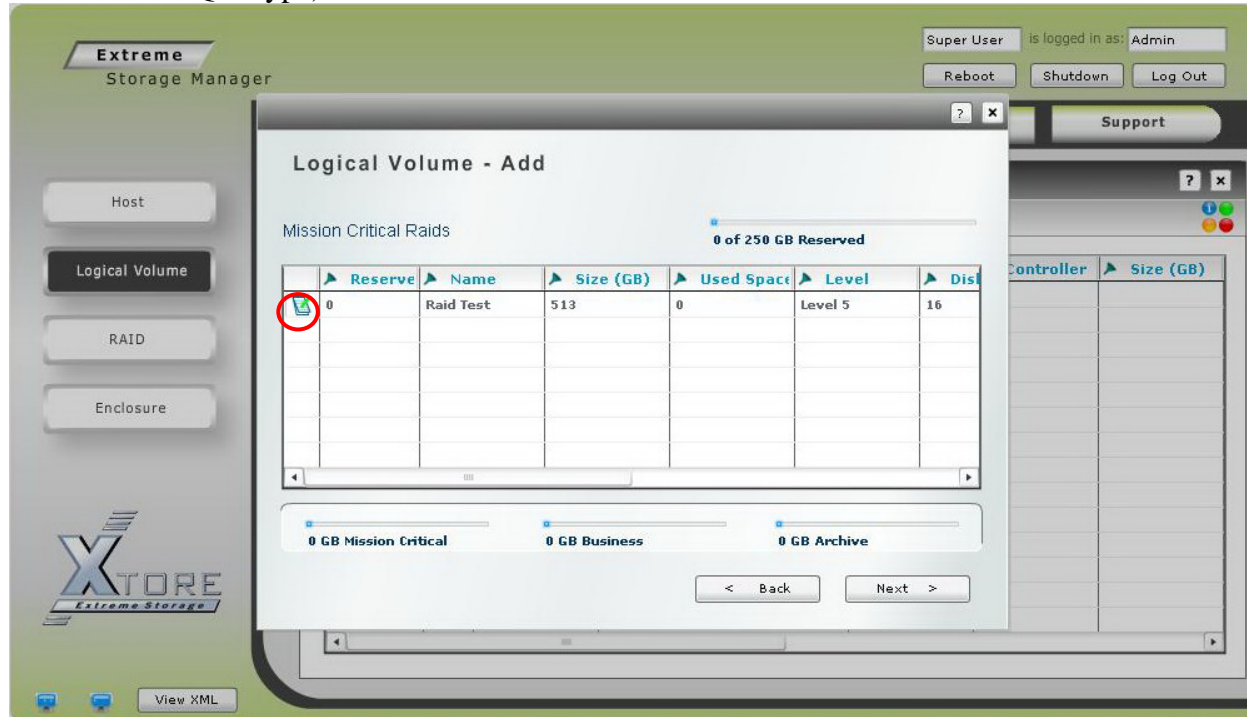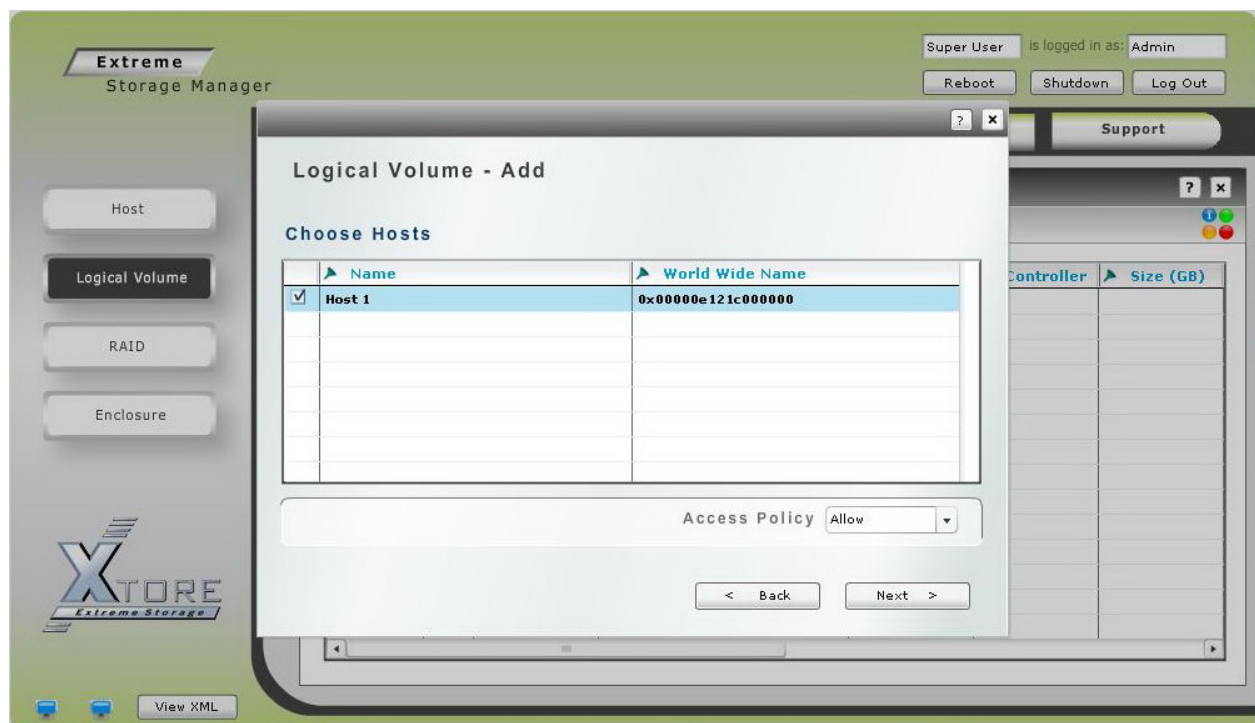

To reserve space on a RAID, click on the icon to the left of the data grid entry for that raid.
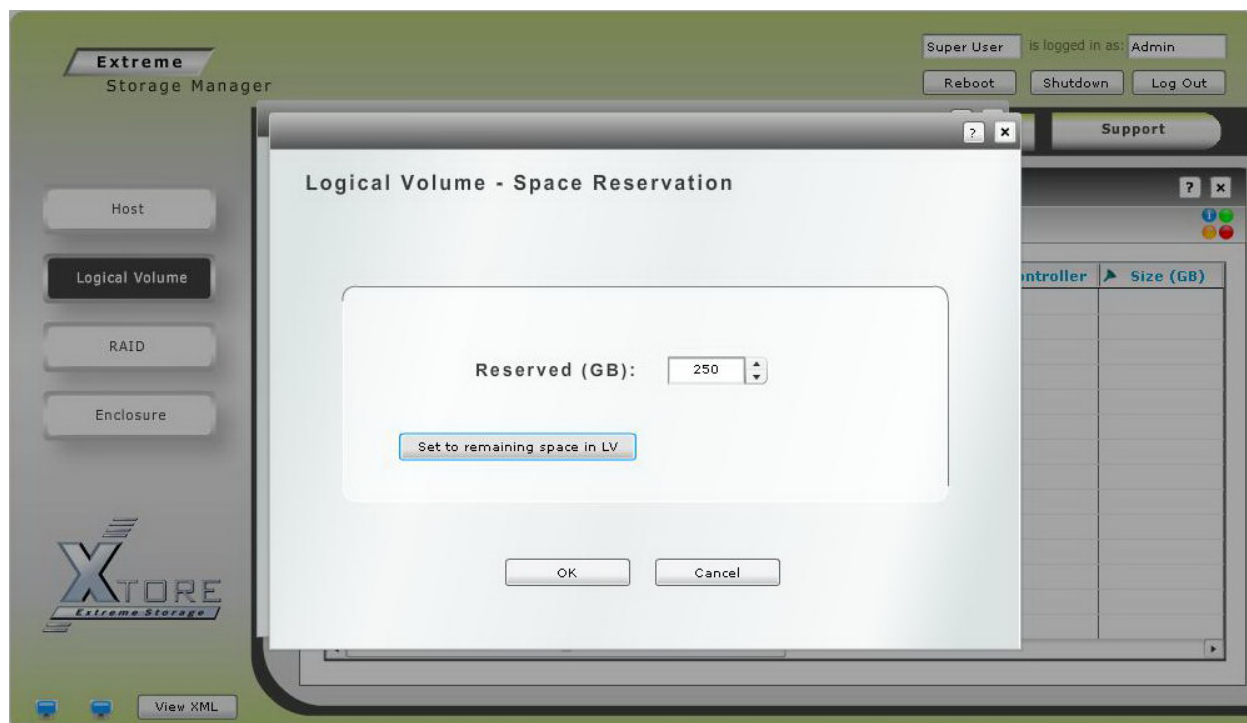
When the space reservation screen appears, select the amount of space one wish to reserve on this RAID. Choose "Set to remaining space in LV" if you want to use all the available space.
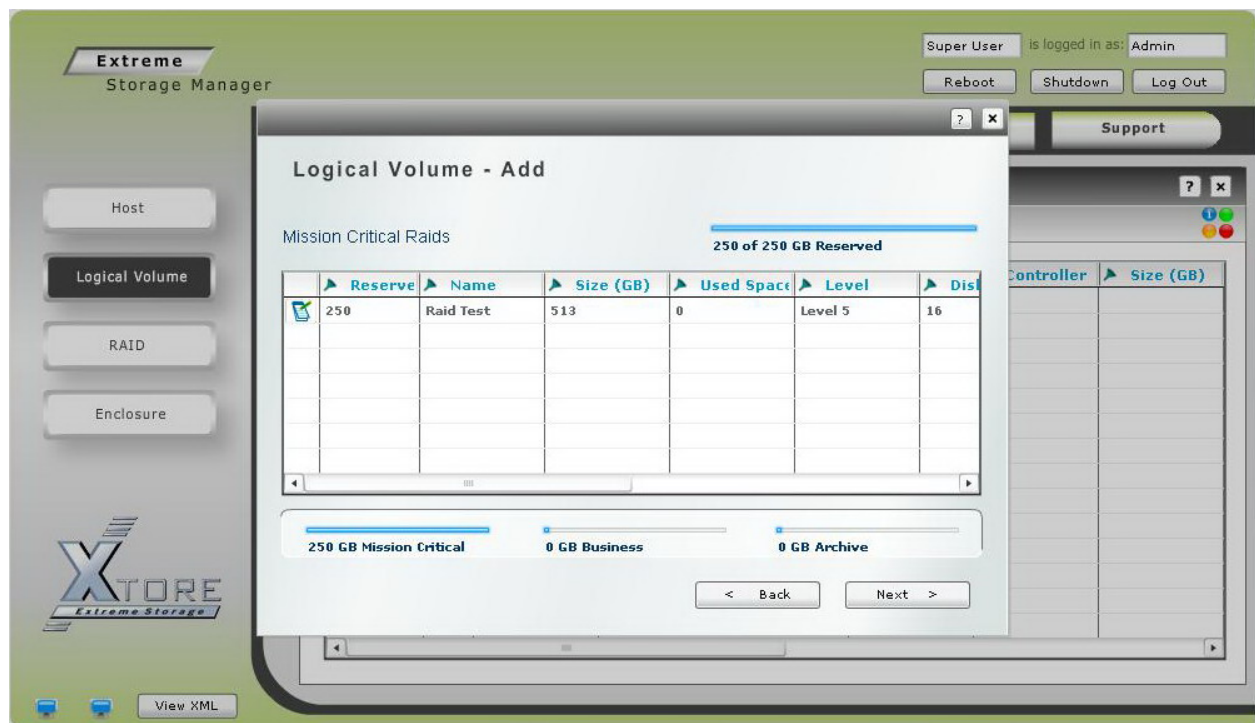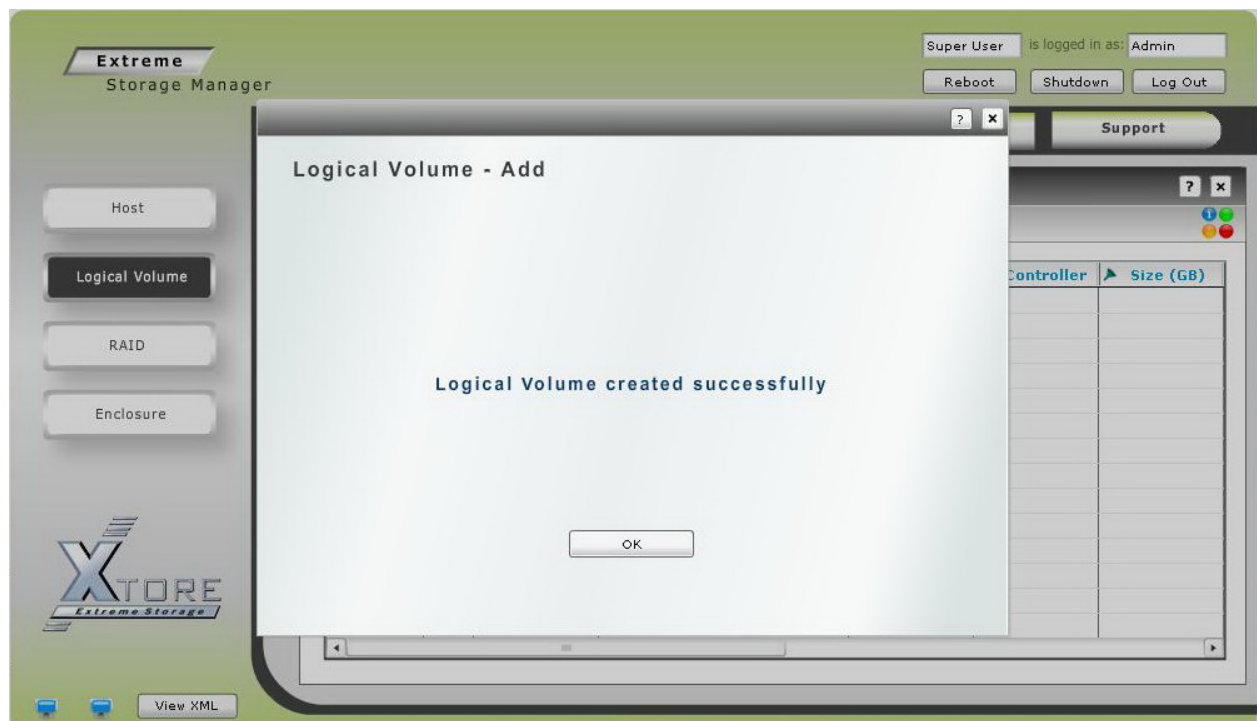
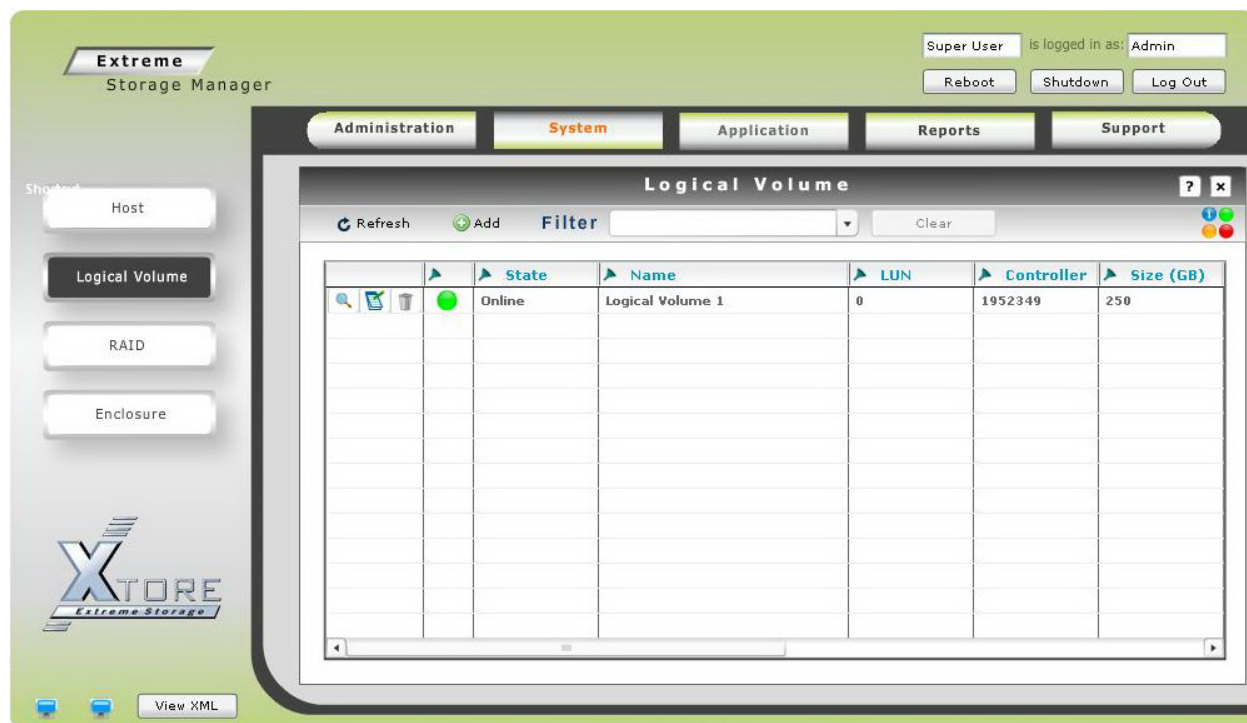The RAID display screen updates to display the required information.

Choose a host (that has been created from Section 4.1.1.) to be allowed to access the logical volume.
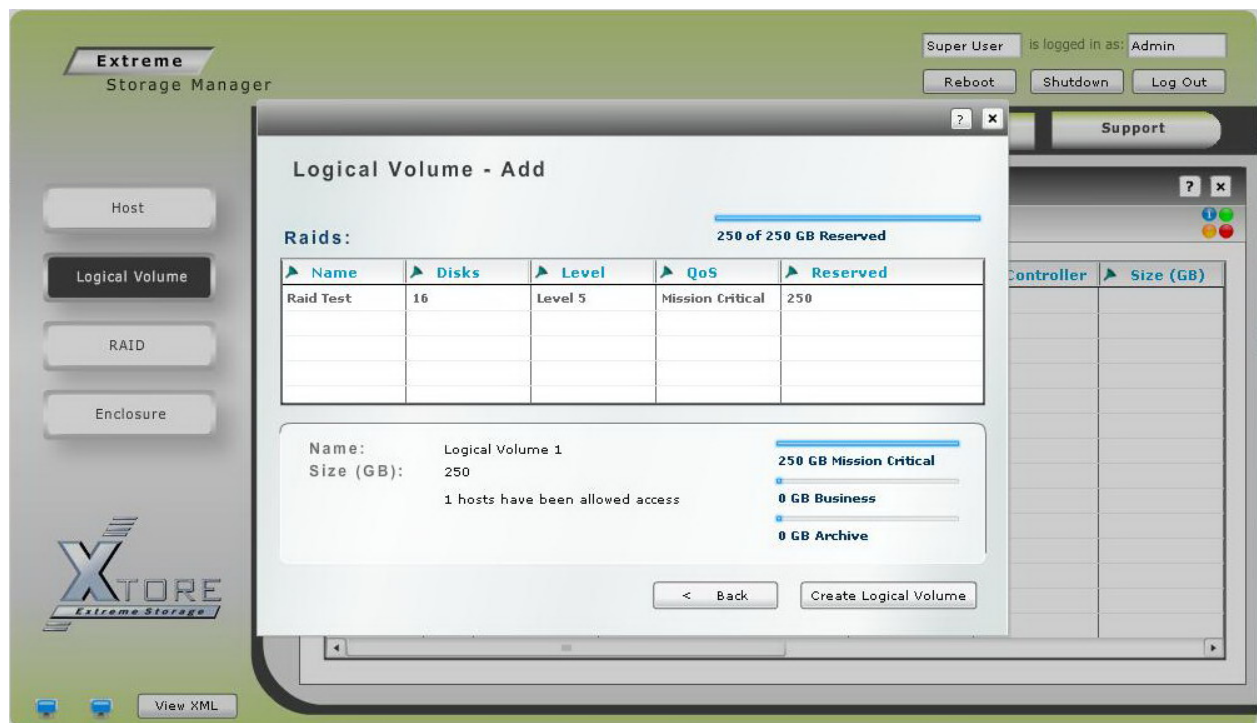
This screen displays all details on the Logical Volume about to be created.

This screen is displayed when the Logical Volume has been created.

The above screen shows one logical volume created. To add more logical volume with the remaining available RAID space, click on Add button.

## 4.1.5. *Spare Drive Explained*

In the RAID creation step, users are given a chance to allocate one or more disks to be spare drives. Note that the spare disks will be taken from the assigned RAID drives. In the example below, 1 disk out of 5 selected RAID 1 disks will be allocated as a dedicated spare disk. The end result will be a RAID 1 volume with the capacity of 2 disks ((number of drives x smallest size of disk)/2), and 1 spare disk.

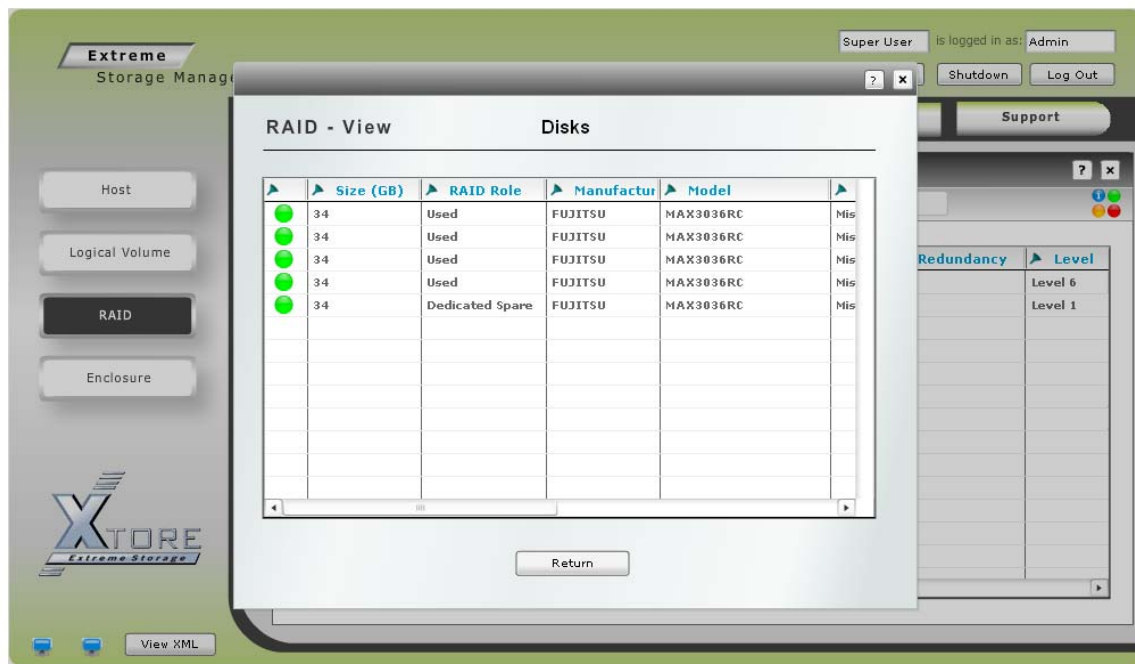The following is the steps of creating spare drives:
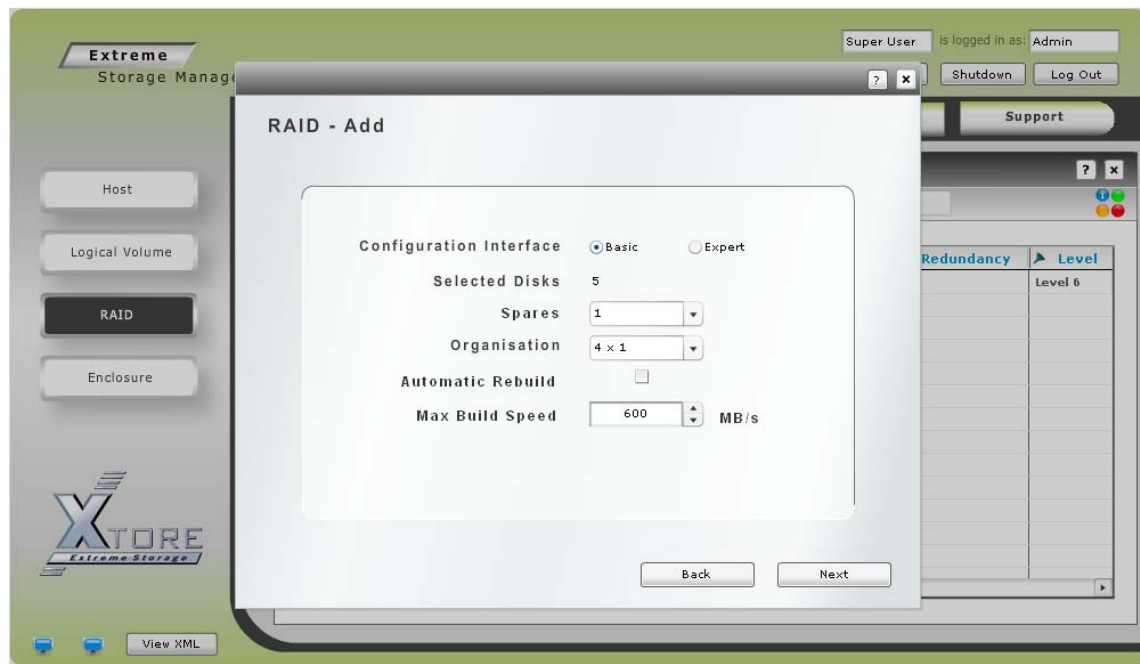
With 5 disks selected, set 4x1 organization and 1 spare.

Below is a diagram explaining how 1U10 RBOD RAID 1 works:
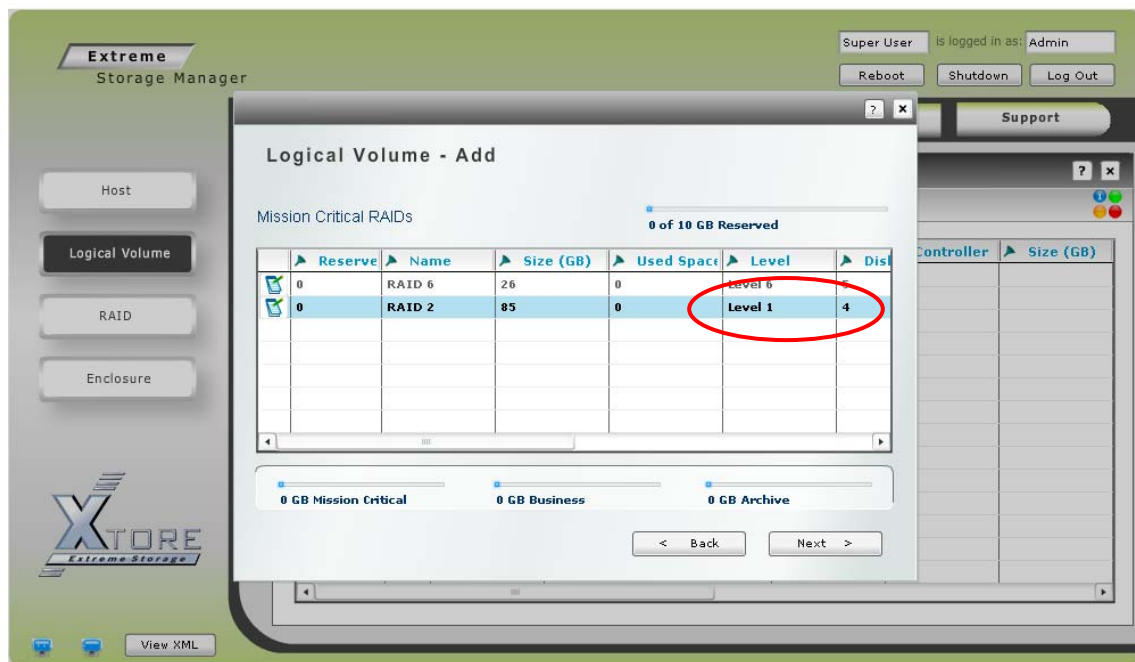

RAID 1 with 4 Disks.
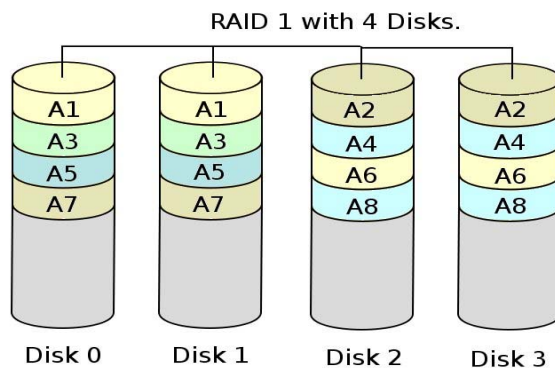
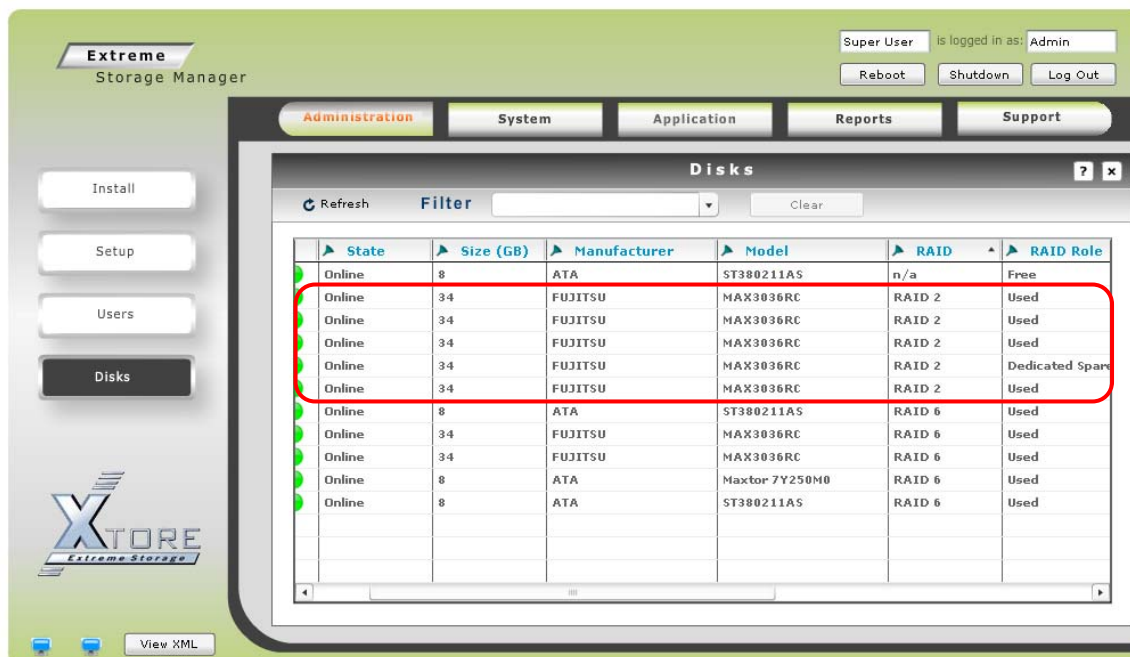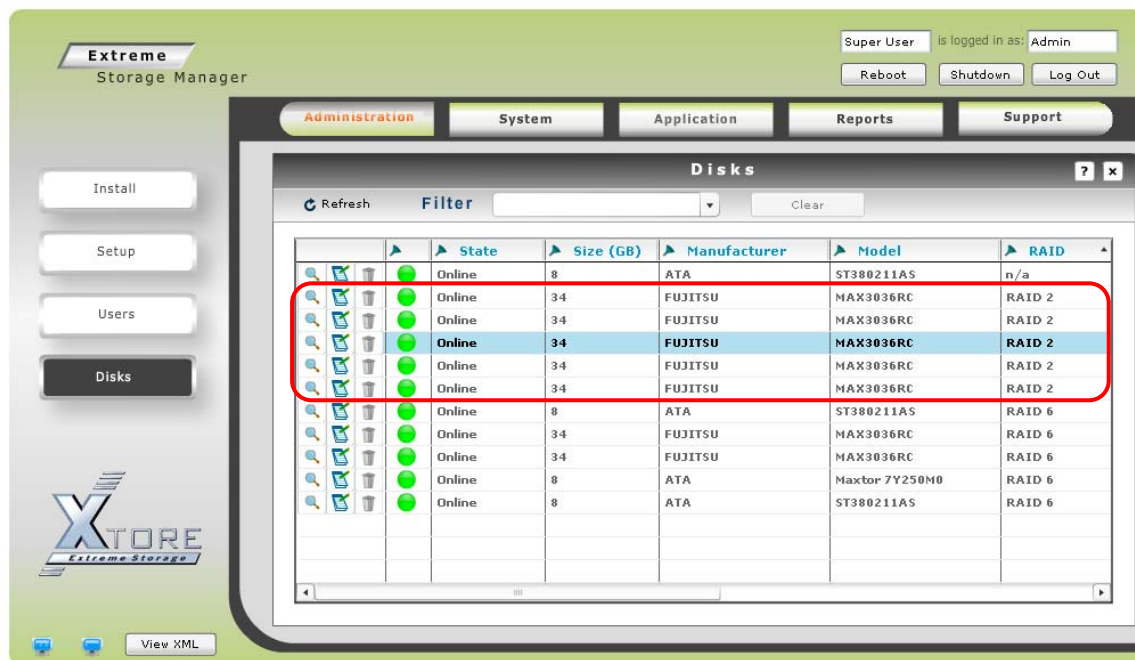A(x) = One copy of a block of data.

The A1 block is identical to the A1 block on the second disk.

The RAID is shown as 4 disks and 1 spare in the RAID VIEW-DISKS field.

Looking at the logical volume, we have 4 disks used in the RAID1 and 1 dedicated spare.

Note: The controller's RAID 1 level also allows the creation of a RAID 1 on odd (or non-even) number of disks.

This means that the creation of any RAID with at least two disks is possible, like the creation of a RAID with 3 disks, 5 disks, 6 disks, 7 disks or 8 disks.

Please see below the diagram explaining the logic behind such a RAID (a RAID 1 with an odd number of disks):

RAID 1   3 Disks
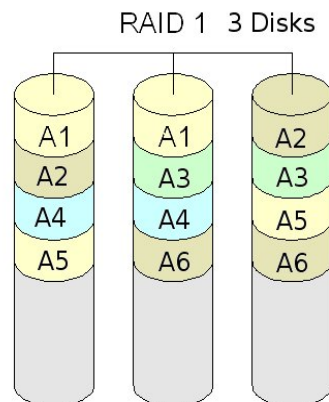
A(x) = One copy of a block of data.

The A1 block is identical to the A1 block on the second disk.

4.2. GUI Overview

Extreme Storage Manager (ESM) is a Graphical User Interface (GUI) embedded inside the 1U10 RAID system. This easy to use utility enables RAID management, monitoring and configuration remotely.
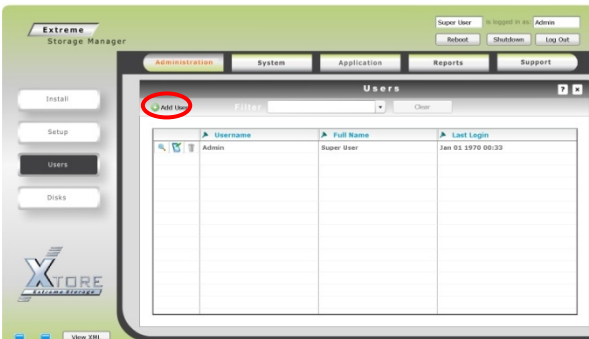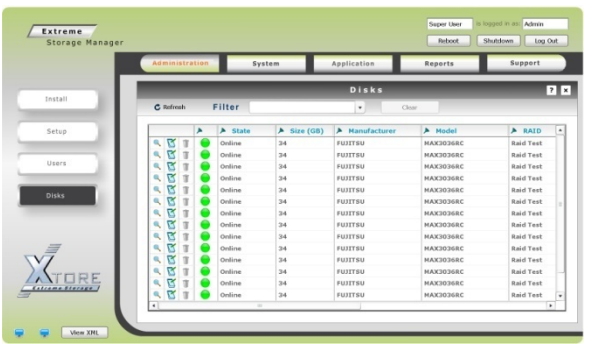
With ESM tool, a system can concurrently support multiple RAID levels (0, 1, 10, 5, 6), a variety of volume group sizes. This flexibility enables ESM to best match user's experience in terms of performance, capacity, and data protection requirements.

ESM does not require installation; its web based interface ensures the low usage of resources thus provides a better experience for the user. To connect to ESM, enter the IP address of the system from any browser.
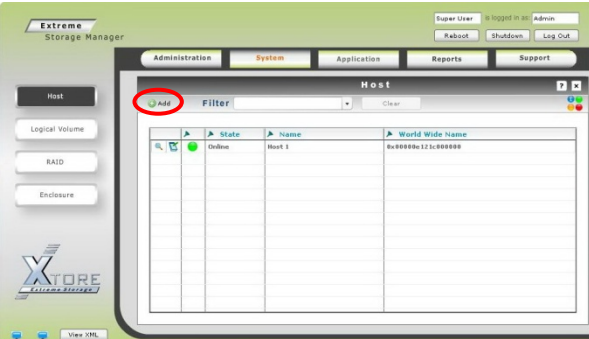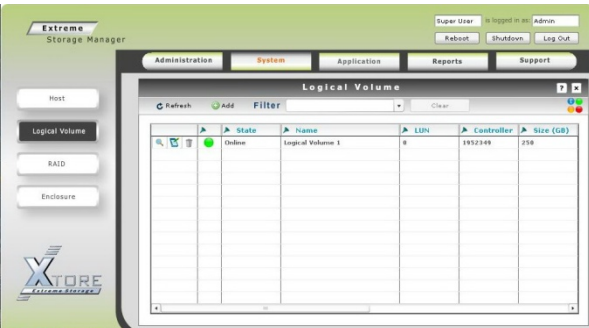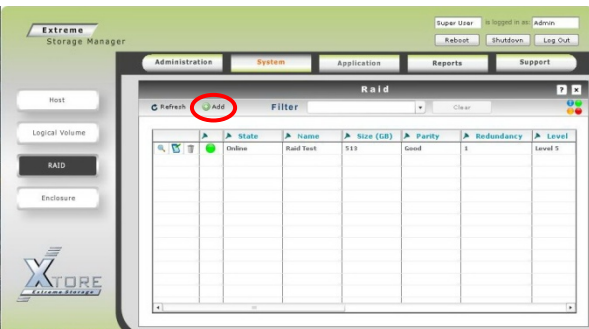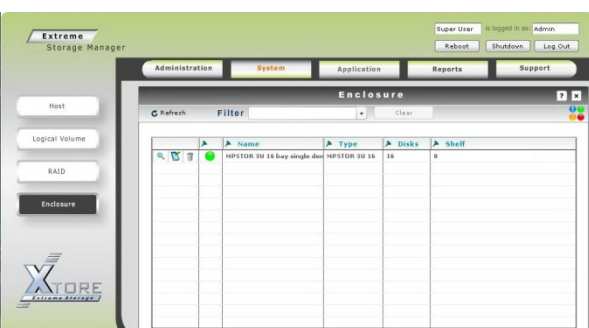
The ESM interface is categorized into five types:

1. Administration: where user can view and manage installed packages, system setup, IP and SMTP setup, users, and disks.

2. System: where user can manages hosts, RAID, Logical Volumes and Enclosure.

3. Application: Snapshot, Replication, and Commissioning are discussed here.

4. Report: it deals with log, history and alert management

5. Support: where user can manage the firmware and look for support.

4.2.1. RAID Administration Menu

Administration Options	Description
Install	List of installed packages in the system.
	🔍 Used to view the software component detailed information
	📋 To install software component
	🗑 To uninstall software component
Setup	An administrator setup that manages System Name, Current Date and Time, SMTP and IP Configuration.
	To setup SMTP, input SMTP address in the form of *smtp.company.org* (or refer to system administrator for the address) and SMTP port (default to 25).
	Check Authentication Required to "Yes" and set a username and password if SMTP server requires it.
	The GUI SMTP feature currently does not support secure connections (SSL/TSL).
Users	This field handles the user creation, managing, and listing.
	To add a user, click on the Add button on left of data grid (shown in the picture).
	🔍 Used to view the user detailed description
	📋 To edit the existing user's password and access privileges
	🗑 To remove an existing user name
Disks	This field listed all the installed hard drives, their status, sizes, manufacturers, models.
	🔍 Used to view the disk detailed description as well as the RAID volume associated with it
	📋 To edit disk's QoS (default is Mission Critical) and RAID role. Refer to Section 4.3 for details.
	🗑 To remove a hard drive from the list
	🟢 Green light is online, Red is fault or offline, Amber is building, click for disk log.
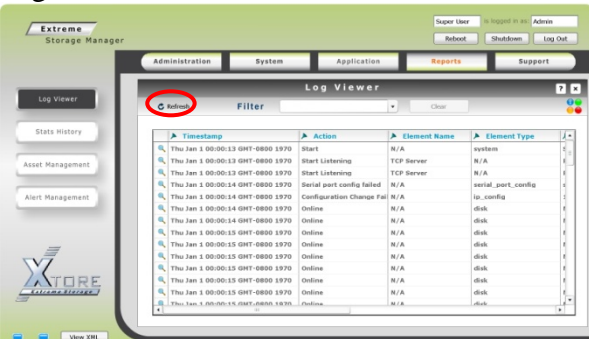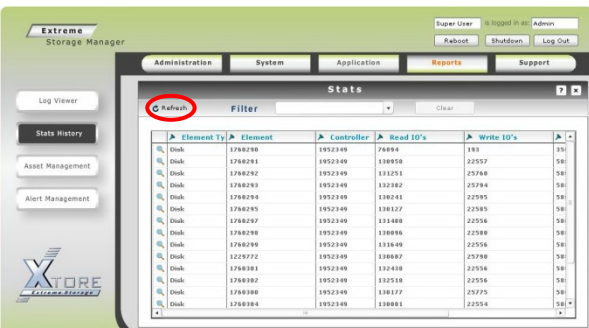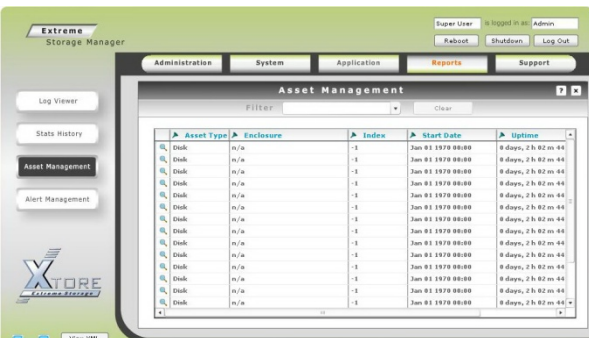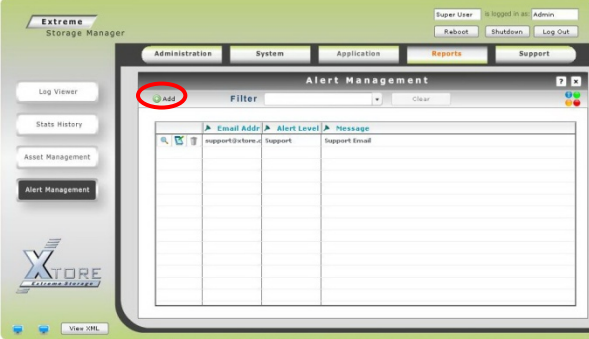
4.2.2. RAID System Menu

System Options	Description
Host 	This field lists and manage the hosts linked to the system. To add a host, click on the Add button on left of data grid (shown in the picture).
Logical Volume 	This field handles and managing logical volumes. 🔍 Used to view the logical volume properties such as LV name, disks. 📝 To edit logical volume's name and stop LV 🗑 To stop and delete logical volume 🟢 Green light is online, Red is fault or offline, Amber is building, click for LV log.
RAID 	To add a RAID, click on the Add button on left of data grid (shown in the picture). 🔍 Used to view the RAID properties including RAID build progress, logical volumes, disks 📝 To edit RAID volume's name, stop and rebuild a RAID. Go to Section 4.4 for details. 🗑 To stop and delete RAID 🟢 Green light is online, Red is fault or offline, Amber is building, click for RAID log.
Enclosure 	This field lists the RAID enclosure as well as the daisy-chained enclosure. 🔍 Used to view the disk detailed description i.e. enclosure front, back view and disks details 📝 To edit enclosure's name 🗑 To remove an enclosure from the list 🟢 Green light is online, Red is fault or offline, click the button for enclosure log
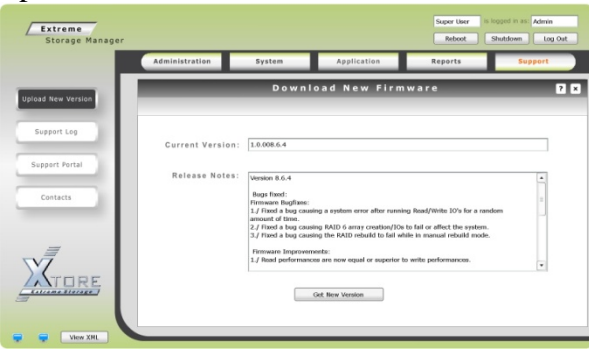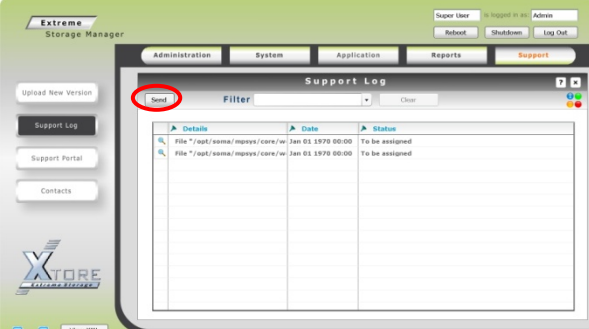
4.2.3. Application Menu

Application Options	Description
Snapshot 	In which some space is reserved for changes, snapshot is presenting a static point-in-time view of the file system
Replication 	This process is to ensure consistency between redundant drives to improve reliability, fault-tolerance, or accessibility.
Commissioning 	TBD
Tools 	Provides tools that is useful for RAID management

4.2.4. Report Menu

Report Options	Description
LogViewer 	This field lists the log of the system Press refresh (indicated by red circle on the picture) to check for a new log. To view the detailed log
Stats History 	This field lists the stat history of disks and RAID arrays Press refresh (indicated by red circle on the picture) to check for a new history. To view the item's detailed description
Asset Management 	This field manages the assets such as disk, power modules, and controllers To view the item's detailed description such as drive manufacturer, power module status and voltage level, controller's HW and FW version
Alert Management 	The RBOD can send out alert of any error and occurrence to a designated email address. To use this feature, SMTP configuration must be activated. To add an email address, click on the Add button Used to view the email detailed description To edit the existing email address and send test email To remove an email address

4.2.5. Support Menu

Support Options	Description
Upload New Version 	This option lists the current firmware version of the box, and to upload a new firmware version. To upload a new version, click on the "Get New Version" button. The firmware image will be available on AIC http server. For a complete instruction, go to Chapter 4.6.
Support Log 	This field lists the debug files generated by the system Press send (indicated by red circle on the picture) to send the debug log to support@mpstor.com. To view the debug lines
Support Portal 	Support portal lists the technical support information.
Contacts 	AIC office, sales and technical support information can be found in Contacts screen.

4.3. Quality of Service (QoS)

This section outlines the QoS selection for individual disks and the usage instructions to create QoS specific RAIDs.

The provided flash GUI allows you to manage the pool of online disk with a QoS (Quality of Service) setting. This setting allows you to easily "mark" drives with a specific QoS setting in accordance to the drive specs.

For instance, one would want to create different RAIDs on different disk quality or specs in order to match the production requirement of this RAID.

A RAID destined to archiving files, for instance, would require bigger but cost effective drives since the RAID will not be used for intensive IOs but rather for large storage. For that reason it might be a good idea to only use large SATA drives for this RAID.

On the other hand, RAID serving very fast and data demanding applications might require less storage space, but sturdier and faster drives, such as more expensive but more reliable SAS drives.

For that reason, the QoS setting was introduced, letting the user marking his drives according to their final use, and to be able to create a specific QoS RAID using the matching User defined QoS drives.

4.3.1. Disk Management

- The QoS setting must be defined for each drive separately.
- The QoS setting can be changed at any time by the User, except if the drive is already part of an active RAID.
- There are currently 3 QoS level settings available on the system:
  - Mission Critical (default level).
  - Business
  - Archive

In order to select the QoS for a specific drive, you need to navigate to the following section within the GUI: Click on the Administration tab →Click on the Disks sidebar button.

Within this disk management view, you will then need to locate the drive for which the QoS setting needs to be changed by clicking on the "disk edit" button as shown below:
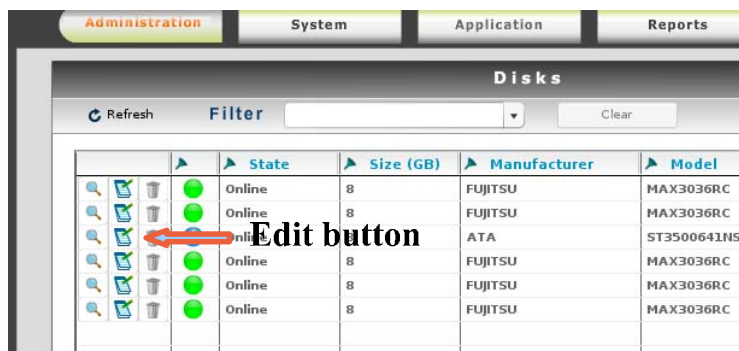
Clicking on this button will bring you to the individual "Disk Edit View":
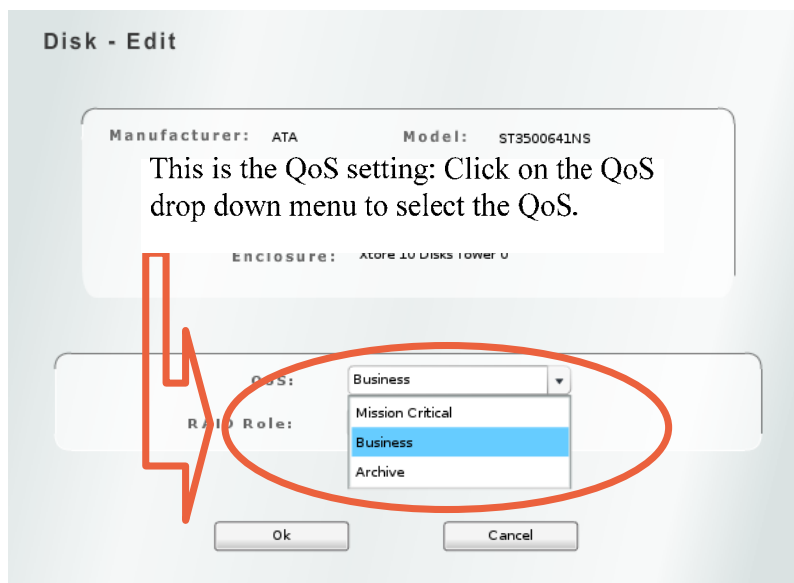
Once you have selected the relevant QoS for this individual drive, click on the "OK" button to validate.

The QoS for this drive had been set. You can now observe the QoS level for this drive in the Disk View. It should have changed to the one you selected, as shown below:

4.3.2. QoS Usage for RAID creation

Once all your drives have been setup with the relevant QoS level, you can then proceed to creating RAIDs.
- Click on the "System Tab" to display the system leftside menu bar.
- Click on the "RAID" leftside button to access the RAID manager.

Click on the Add button. The RAID creation helper window will then pop up as follow:
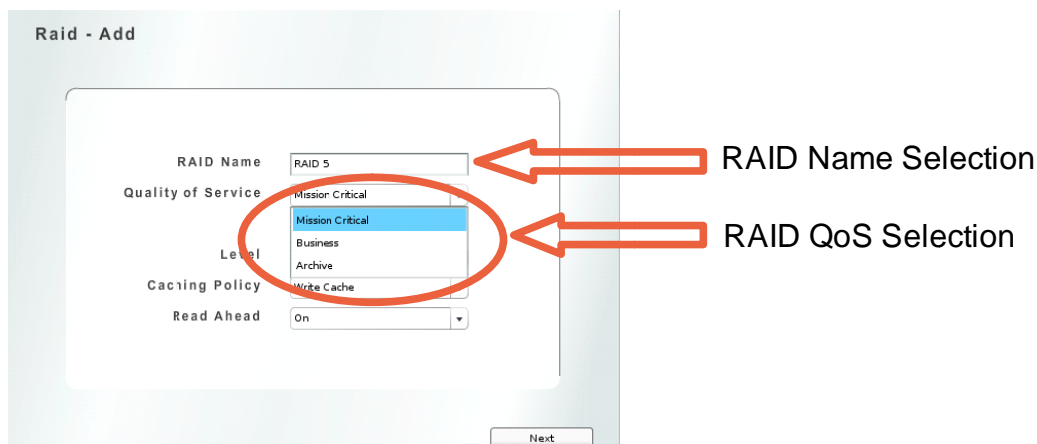
- Pick a name for this RAID (the name cannot be longer than 15 characters).
- Choose a QoS for this RAID using the Quality of Service drop down menu, as shown above.
- Choose a RAID level for this RAID (0, 1, 5 or 6).
- Click on the "Next" button to proceed.

In the below example, we are choosing "Business". We previously setup 3 disks with the "Business" QoS setting:
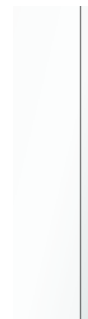
Clicking on "Next" brings us to the Disk Selection. We can only see disks that have previously been setup with a "Business" QoS level since we are creating a "Business" QoS level RAID:

We can now click on the "Create RAID" button to complete the RAID creation process and start the RAID building process.

The built RAID will be a "Business" QoS level set RAID. Its level cannot be changed unless the RAID is taken apart.

To summarize:

- The QoS is a handy feature that can facilitate disk and RAID management in a system containing multiple enclosures with large amount of disks.

- One example of the feature is that it can be used in conjunction with User management, where a User could be setup with permissions to only "Add" items, but not delete nor modify them. The User in question would then have to create RAIDs using the pre-determined disks QoS.

- The Administrator of the system could then setup a specific QoS for each disk while setting up the system and let Users creating RAIDs only using the pre-determined disk QoS settings.

4.4. RAID Rebuilding

This section outlines the RAID rebuilding process, manual or automatic, as well as practical usage information on the RAID rebuilding feature.

Because of the nature of a RAID, a disk belonging to an array will fail at a certain point of time. The advantage of the RAID is to recover from this condition, without any data loss. To do so, a drive that has either been removed, or failed, will need to be replaced with a similar drive (size, type), to "rebuild" the RAID to a healthy status.

The disk used in an array to replace a failed/missing drive is called a "spare", or "Hot Spare".

The fact that when a RAID 5, for example is running on a "degraded" mode (with one missing drive), is prone to corruption if any of the remaining drives fails, calls for an urgency to replace the drive.

Because of this high demanding availability of administration, some automatic measures have been put in place.

The Automatic rebuild feature is one of them. On a system with pre-defined "Hot Spares" or "spare" disks, the automatic rebuild feature will automatically rebuild a RAID array that got into a "degraded" state with one of the hot spare drives, if it is of similar size specifications.

4.4.1. Manually Rebuilding a RAID Array

In the figure below, we can see that the existing RAID on the system is "degraded" (i.e. one of its drives is missing or failed). This is represented by an orange graphic button as well as the "status" mention: "Degraded".

RAID Status color coded button.

RAID Parity status

RAID View button icon.
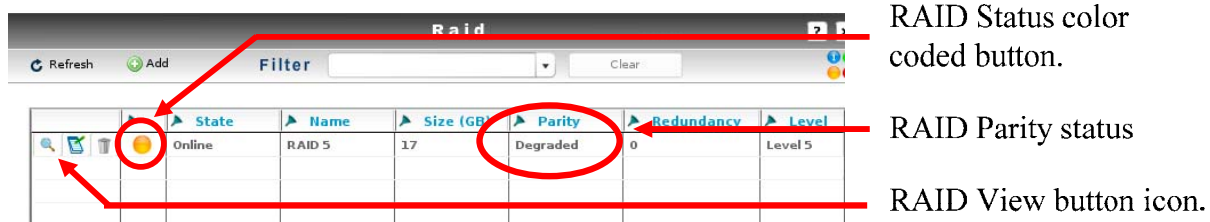
- Clicking on the magnifying glass left of this RAID allows us to access the RAID disk view, which gives us an overview of the disks belonging to this RAID

This disk's color coded status is RED and therefore indicates a failure.

This disk status is Online and green.
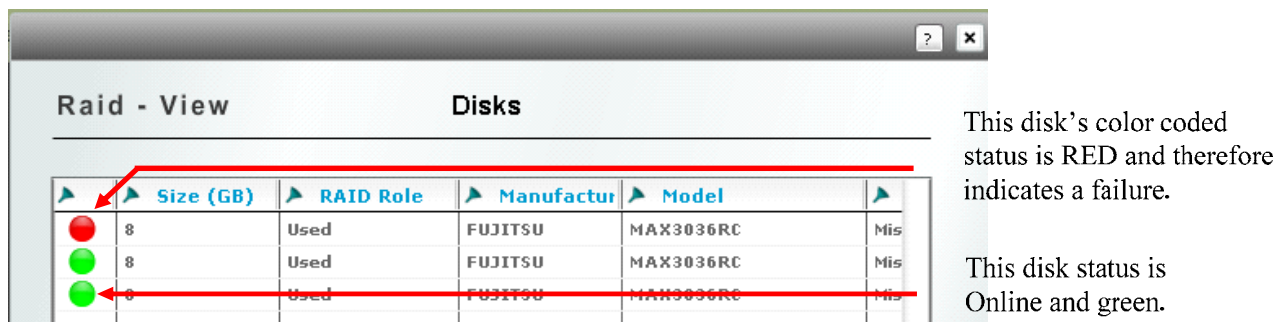
- On the picture above, we can see that one of the disks appears offline. That disk was removed from the bay. The offline/failed disk has got a Red status button, while the online disks have got a Green status button.

- Clicking on "Return" then "OK" brings us back to the general RAID view window.

- Clicking on the RAID "Edit" button (The small notepad icon in between of the "RAID View icon" (magnifying glass) and the "RAID delete icon" (bin icon), shows us whether this RAID is set to rebuild automatically or not
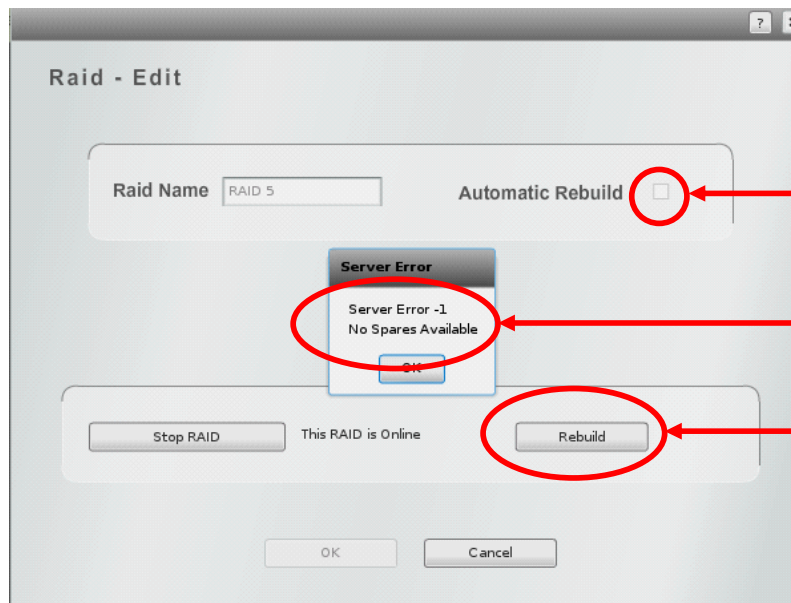
Automatic Rebuild Tickbox. This can be set when a RAID is offline.

Error message yielded by clicking on the Rebuild button when no spare disks are available

Rebuild button used to manually rebuild a RAID array.

- In the above example, we can observe that the "Automatic Rebuild" tickbox is not set.
  - o The Automatic Rebuild feature is therefore not enabled.

Note: the Automatic Rebuild feature can only be enabled at the RAID creation stage or while a RAID is offline.

- We then tried to click on the "Rebuild" button from the RAID view, which immediately triggered the following error message: "No Spares Available".

This error message is due to the fact that we did not previously set any spare drives, or "Hot Spares". We now need to add such a drive to our "disk pool" in order to rebuild our "degraded" RAID array.

4.4.2. Managing Spare Drives

In order to add spare drives to the disk pool, you need to click on the "Administration" tab, and then click on the "Disks" left side-bar button icon.

This will bring you to the "Disk view" menu, as shown below:

A spare disk needs to be the same size as the size of the drives in the RAID it will be used in.

RAID Role summary. Can be "Free", "Used", "Dedicated Spare" or "Global Spare"

This Disk is Offline.

This view gives you a detailed list of all the disks connected to your system. Here we can see that one disk has become offline. It belongs to the array called "RAID 5" that we have used previously.

We can see that two of the RAID pool disks do not belong to any RAID (i.e. the RAID column shows them as "n/a" or Not Available.). Moreover, their "RAID Role" status is set to "Free", which means they have not been reserved for a later use, nor been set as "Dedicated Spare" or "Global Spare" disks.

We now need to pick one of these disks to replace the missing drive from the "RAID 5" array. We first make sure that this new drive is the same size as the missing drive by comparing the displayed size of the free disks with the one of the missing disk.

In the above example, the free drives and the missing drive are all 8GB, which makes the two free drives ideal candidates to become "Hot Spares".

We then choose one of these two drives, and click on the drive's "Edit" button. The "Disk Edit" view is then displayed as shown below:

Click on the "RAID Role" drop down menu to display the list of available roles, and select the required role for this disk to set it. Click "OK" to validate your choice.

We can now change the "RAID Role" from "Free" to either "Global Spare" or "Dedicated Spare" by clicking on the "RAID Role" corresponding drop down menu.

Note: the difference between these two roles is a priority difference. Rebuilding a RAID will select the first available spare from the Global Spare disks, and if none available, from the Dedicated Spare disk pool.

Note: the QoS for the spare disks is not taken in account when rebuilding a RAID manually nor automatically. For instance, a RAID with a "Business" QoS can be rebuilt with an "Archive" QoS disk.

Once the "RAID Role" has been set, click on "OK" to validate.

We can now re-attempt to rebuild the array by clicking on the "System" tab, then clicking on the "RAID" left side-bar menu icon, followed by clicking on the "RAID Edit" button (the notepad icon).

Clicking on the "Rebuild" button now closes the "RAID Edit" view and starts rebuilding the RAID. A click on the "Refresh" button will be required to observe the RAID new state:
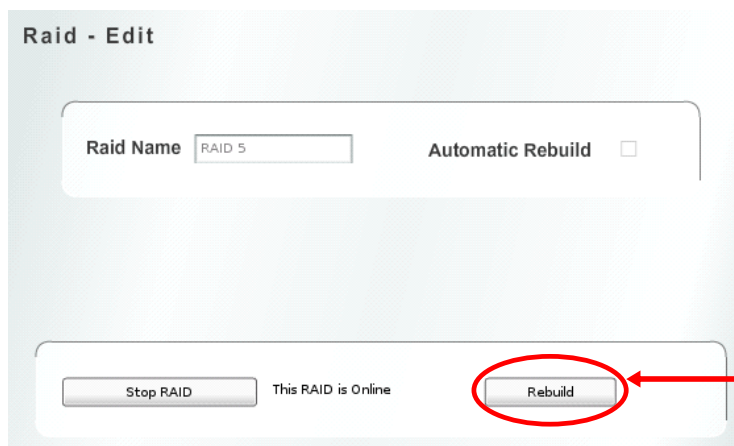
This is the "Rebuild" button used to rebuild a RAID manually.

We can see here that the RAID is being rebuilt, after having clicked on the "Rebuild" button.
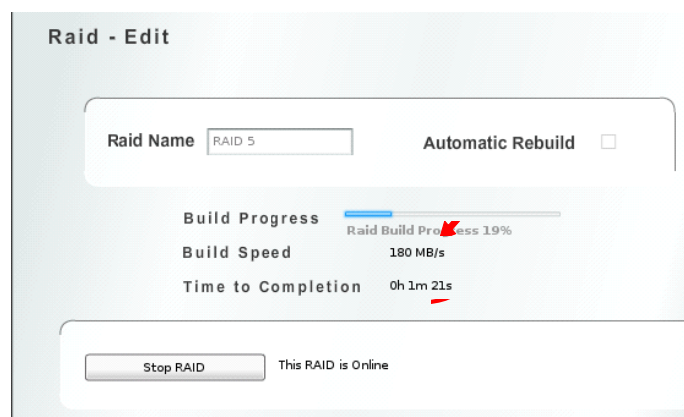
The build progress indicates the percentage of the RAID rebuild process done.

Overall speed at which the RAID is rebuilding.

Estimated time to completion, based on the build speed.

The picture above shows the RAID rebuild process. The progress bar indicates the overall process completion status, while the "Build Speed" field indicates at what speed in Mb per second the array is being rebuilt over all the disks. The "Time to Completion" field is an estimate of the remaining time needed to rebuild the array fully. This estimate is based on the overall Build Speed rate and may decrease or increase depending on what actions are being performed on potential other RAIDs Online the system.

Once the progress bar is full, the RAID rebuild status will go back to 0 percent: This means the RAID has finished rebuilding. The RAID View window can now be closed. The RAID status should now have changed from "Building" to "Online":

Your RAID is now rebuilt. However, this procedure needed the intervention of a person to complete. Because of the urgency of rebuilding a RAID as mentioned earlier, using the Automatic Rebuild feature would save a lot of time and effort in order to rebuild a RAID.

4.4.3. Using the Automatic rebuild feature

The previous sections of this documentation module already covered how to add a Spare to the disk pool, manually rebuild a RAID, monitor the progression of the RAID rebuild as well as the completion of the procedure. This section will explain how to setup an automatic RAID rebuild procedure to reduce human presence to admin the system.

Setting up the "Automatic Rebuild" feature at RAID creation time:

- Create a new RAID by clicking on the "Add" icon from the "RAID View" general view.
- Select the QoS, the RAID level required for this RAID.
- Click on "Next" and select the disks required for this RAID.

- The next view lets you customize the RAID geometry as well as the number of spares required.

Number of Spare disks required to create the array with. The Spare disks will be shared with other RAID arrays using disks of a similar size.

"Automatic Rebuild" feature tickbox, used to enable or not the Automatic rebuild feature for this specific RAID.
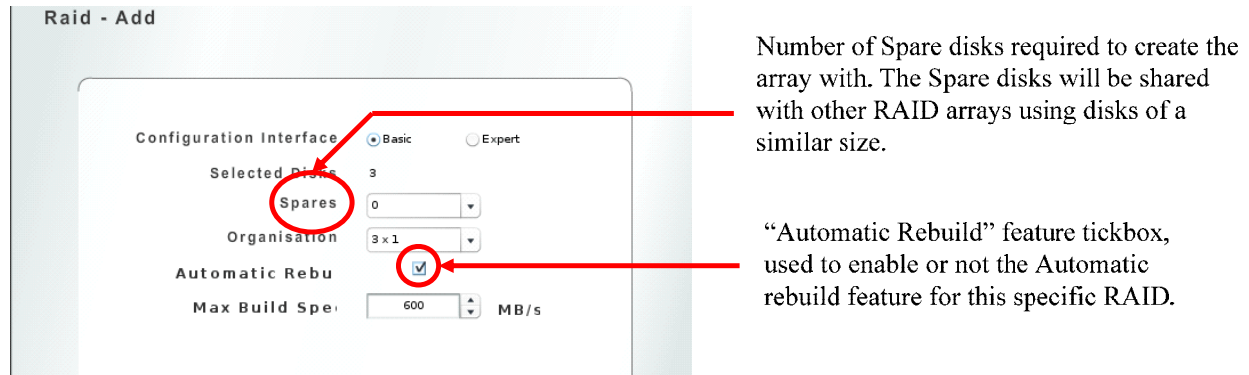
Tick the "Automatic Rebuild" box as shown above to enable the Automatic rebuild feature for this RAID. If this RAID loses a drive, the Automatic Rebuild feature will start rebuilding it straight away, but only if a spare is available for it.

Note: it is a good idea to select one more disk than required for the RAID to set it up as spare before the RAID creation. It avoids having to do so later on and makes sure at least a number of spare disks of the right specifications will be available when needed for this RAID.

Click on "Next" and then on "Create RAID" to finish the RAID creation process.
Your RAID should now be building.

Once your RAID is built, if one of your RAID drive is pulled, or fails, your RAID array will start rebuilding automatically and immediately, should any spare disk be available.

Setting up the "Automatic Rebuild" after RAID creation time

It could happen that a RAID that was created without the "Automatic Rebuild" feature needs to be set as so.

To change the Automatic Rebuild setting on a specific RAID, click on the "Raid edit" button (notepad icon) from the "RAID View" general menu.

The Automatic Rebuild feature has been ticked, which enables the feature for this RAID once the choice is registered by clicking on the "OK" button.

RAID status indicator. A RAID can be either Online or Offline.

RAID Stop/Start button. A RAID needs to be stopped to be able to enable the Automatic Rebuild feature

The Automatic Rebuild box can only be activated while a RAID is offline.
For that reason, the RAID needs to be stopped (if no activity is currently performed on it), by clicking on the "Stop RAID" button.

Once stopped, the Automatic Rebuild tick box, previously grayed out, becomes active.

In order to activate it, tick the box corresponding to the Automatic Rebuild field, but do not directly click on the "Start RAID" button. This would cause the feature to be reset to the state it was in before stopping the RAID and would cause the RAID to restart without the feature being activated. Instead, once the box is ticked or unticked, click on the "OK" button to validate and save this option onto the RAID. Once done, the Raid – Edit view form should close and you will need to reopen it, and click on "Start RAID" to restart the RAID. You should observe that the Automatic Rebuild tick box displays your setting and will get grayed out once the RAID has restarted.

Automatic Rebuild Behavior

With the Automatic Rebuild feature enabled, and your disk pool containing at least one spare disk of the similar specifications (similar size), pulling an active RAID disk from its bay will automatically start rebuilding the array in which the disk is contained, even if the RAID is being used at the same time, in total transparency. In the picture below, one of the RAID disk was pulled, which kicked in the RAID rebuild process automatically:
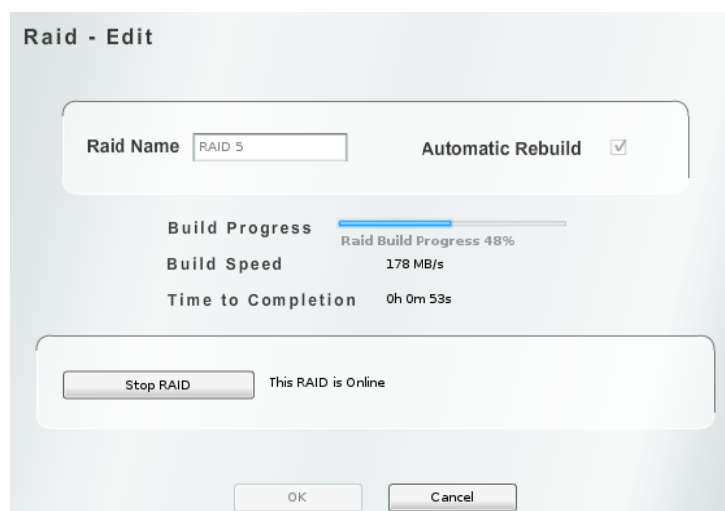
Clicking on the "Edit RAID" button (notepad icon), will show you that this Automatic Rebuild RAID is being rebuilt, and will show you the RAID rebuild progress bar, the RAID building speed in Mb/sec as well as an estimated time to completion.

Clicking on the "Cancel" button and clicking on the "RAID View" button (magnifying glass), then clicking on the "View Disks" button icon will show you that the Offline disk, the disk that

was pulled, has been "kicked out" of the array and replaced by a good disk, which was taken from the "global" or "dedicated" spare disk pool.

The disk that was pulled was automatically put back in the disk pool, with the "Offline" mention, and we can clearly see that it's RAID Role has changed from "Used" to "Free", and that it does not belong to the RAID named "RAID 1" anymore.

We can see also that one of the "ex" spare disk, that had a "Dedicated Spare" RAID Role, is now part of this array.

The Automatic Rebuild Process has now successfully completed. A good idea would be to replace the failed/pulled disk by a healthy disk of the same size and mark it as a "Dedicated Spare", to organize a spare replacement for the spare disk we just used to be ready for the next potential disk failure.

Usage examples:

RAID Rebuilding is an essential part of the RAID technology. Without it, an array would only accept one and only failure, after which the data would not be considered as safe. This is for this reason that enabling an Automatic RAID Rebuild feature greatly reduces the time window at which an array is considered at risk, i.e, when one of its components, or disk, has failed or has been removed.

However, this feature requires a sacrifice of one or more disk per array in order to work automatically. But peace of mind can sometimes balance the lost of storage space.

The RAID rebuild feature can be used in conjunction with the Alert manager, which will alert the system administrator in case of a disk failure. Activating the Automatic Rebuild feature will then rebuild the degraded RAID automatically and immediately, together with alerting the system administrator that a RAID had gone in a degraded state and is now being rebuilt.

4.5. Using Filters in the GUI

This section outlines the usage of filters for administration purposes and ease of use within the AIC RAID Controller GUI.

The system you are working is a complex system, which can gather and accumulate a lot of assets and information that can cause confusion if not presented properly to the User.

For this reason, a set of data and asset "filters" were implemented to facilitate the usage and the information finding on this system.

The filters can be used within the GUI with any item that is listed in a data list, i.e., an item present in a table with columns and rows, and can be combined between elements for a narrower search.

Using filters – How to use the filters within the GUI:

For documentary purposes, we will use the filters within the Log Viewer only, although it is good to note that they can be used in many of the GUI's sections.

Locating the "Filter" button:
Although the filter feature is very intuitive, the User has to know where to find the feature first. The filter menu is located at the top of a data sheet's column, represented by a small pin ⚲ icon.

These pins are all corresponding to different possible filters for each data type represented in each column. The filter type will vary depending on the data type being filtered . For a date, a date filter will be displayed , for a field containing text , a general filter will be

The picture above shows all the different filters available for this "Log Viewer" view. There is one "Filter" pin available for each column, allowing to select which column or element is to be filtered.

In the following example, we will be filtering the "Element Types" in order to display the log entries only regarding the "logical_volume" elements types.

You will first need to click on the corresponding column's "Filter" pin that you need to setup the filter for. Therefore in our example we click on the "Element Type" Pin icon.
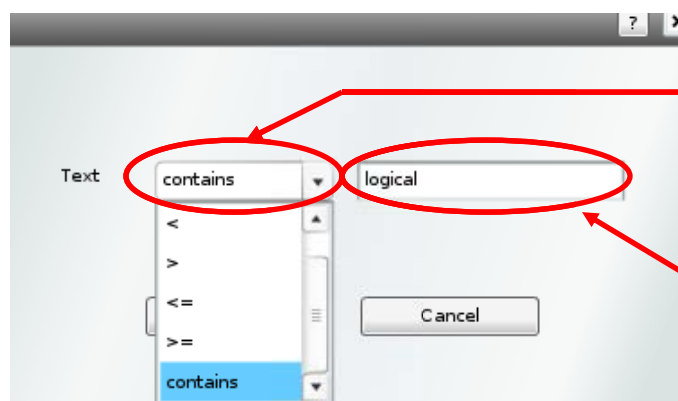
This drop down menu allows you to pick from the available "operands" or modifier for your filter.

This box allows you to input the text used by the filter to display the relevant entries you are looking for.

The "Filter" setup window will open as shown above. Depending on the data type contained in this column, this window will vary to match the best search options with the data type. For instance, a column containing text and numbers will allow you to search with the following operands:

- < - to search for a value under the specified value.
- > - to search for a value over the specified value.
- <= - to search for a value under or equal to the specified value

- >= - to search for a value over or equal to the specified value.
- Contains – This is a text and number search features, searches for a value containing the same string of text or number as specified.

There are more filters setup window types for different data type. They will be reviewed later on.

In the above example, we need to select the filter operand to "contains" and input the search query required, "logical". Once our filter is set, we then need to click on the "OK" button to activate the filter.
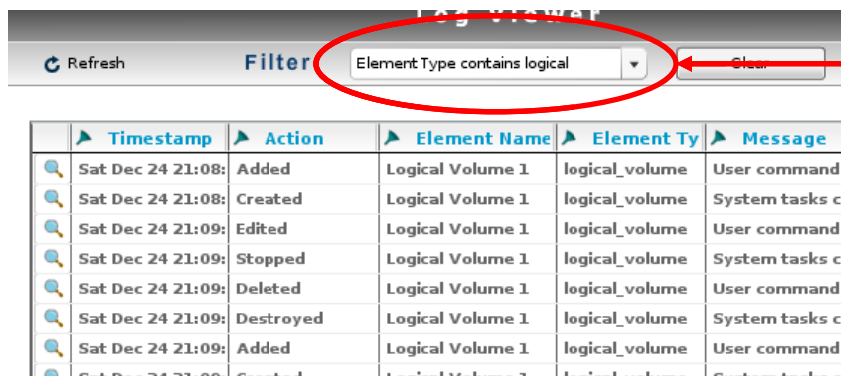
This is the filter summary drop down menu. It displays the most recent active filter. Clicking on it will display the full list of active filters.

The filter has been activated, and only the "Element Types" containing the word "logical" are being displayed.

This facilitates browsing of all the events relating to the Logical Volumes.

However, there could be too many Logical Volume events while we only want to display the Logical Volume events that occurred after the 5th of November 2008. We will then need to combine the existing filter with a second "Timestamp" or date filter.

Combining filters

Combining filters is very straight forward. Once a filter is active and is being displayed in the "Filter" drop down menu at the top of the active page, a new filter can be combined to the existing one by simply creating a new filter.
In the below example, we will add a "Timestamp" filter to the existing "element_type" one
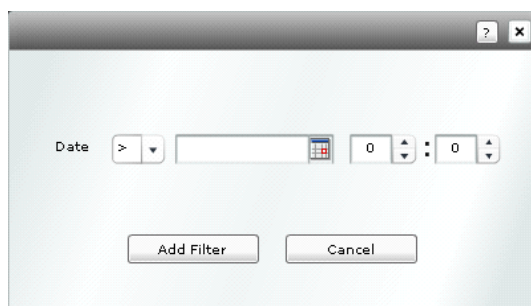
The calendar icon needs to be clicked in order to display the Date picker helper.

The arrows allow to skip one month back or forth.

The day selection allows to pick the required day to search for.
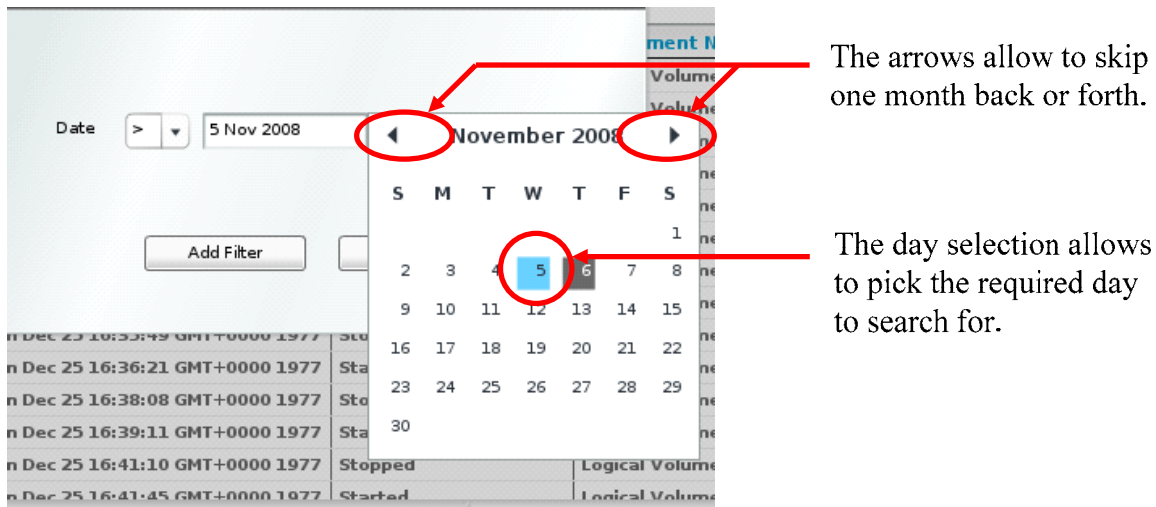
We first need to click on the "Timestamp" Pin icon to bring the Timestamp filter menu up. We can observe that the filter selection has changed slightly for this "Date" filter data type.

A calendar date picker allows us to pick the specific we want to filter the events from.

We choose the date as higher than the 5th of November 2008 and validate by clicking on "Add Filter".

The Log Viewer now only shows the events concerning the Logical Volumes that occurred after the 5th of November, as requested:

This deleted all the existing active filters.

Clicking on the "Clear" button will clear all the active filters listed in this drop down menu.
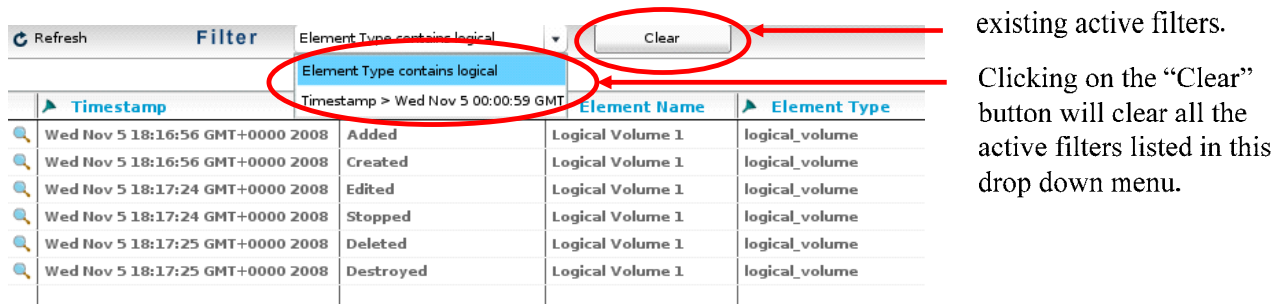
Once we have finished using the filters, they can be cleared to resume the display of a full "Events" page by clicking on the "Clear" button.

Filter usages and conclusion:

The Filters are a great feature that can seriously reduce the time involved in browsing through over populated event logs, or when dealing with multiple enclosures daisy-chained to a single, central controller. They can be combined for perfect tuning of the queries and can be cleared very easily. The filters are automatically changing regarding of the data type you are filtering, and the following filter types are available on the system:

- Text filtering with < > = contains operands.
- Date filtering with a calendar date picker helper as well as minutes and seconds.
- Value picking, used to pre-set standard values, used for a status for instance.
  - Value picking allows you to pick a filter attribute from all the possible values for this item, for example: "State: Start, Online, Offline".

In order to use a filter, simply click on the column's Pin ![icon] icon and follow the instructions.

4.6.   RAID Firmware Upgrade

1U10 RAID provides a firmware upgrade through http server only. Firmware image will be stored in AIC HTTP server to make the firmware upgrade process effortless.

The unit's firmware is stored on an inboard flash memory chip that can be flashed to apply updates, or fix the system.

The system can be flashed from the GUI, in the "Support" section. A tab called "Upload New Version" allows you to flash the controller using fresh firmware images.

In order to transfer these images onto the controller's flash, a HTTP connection will be used from the controller to an AIC HTTP server sharing the required upgrade firmwares.

Should the AIC http server become unavailable, another way to upgrade the firmware is through local download. The following details how to install a free, very simple and small HTTP server for the Flash upgrading purpose:

1. Foremost, download the latest firmware from AIC website and extract it to reveal the firmware files inside a folder as follow:
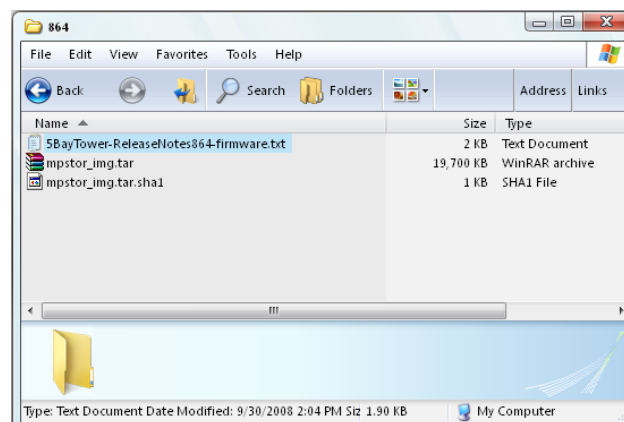
1. Download and open a simple HTTP server program from http://www.rejetto.com/hfs/ called *hfs* (HTTP File Server).
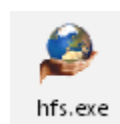
2. Please follow the diagram below to upload the firmware file into the http file server. Make sure that you are using port 80.

- Select Menu → Add folder from disk
- Choose the folder extracted from the downloaded firmware file
- Select "Real folder" and the folder will be uploaded to the local server
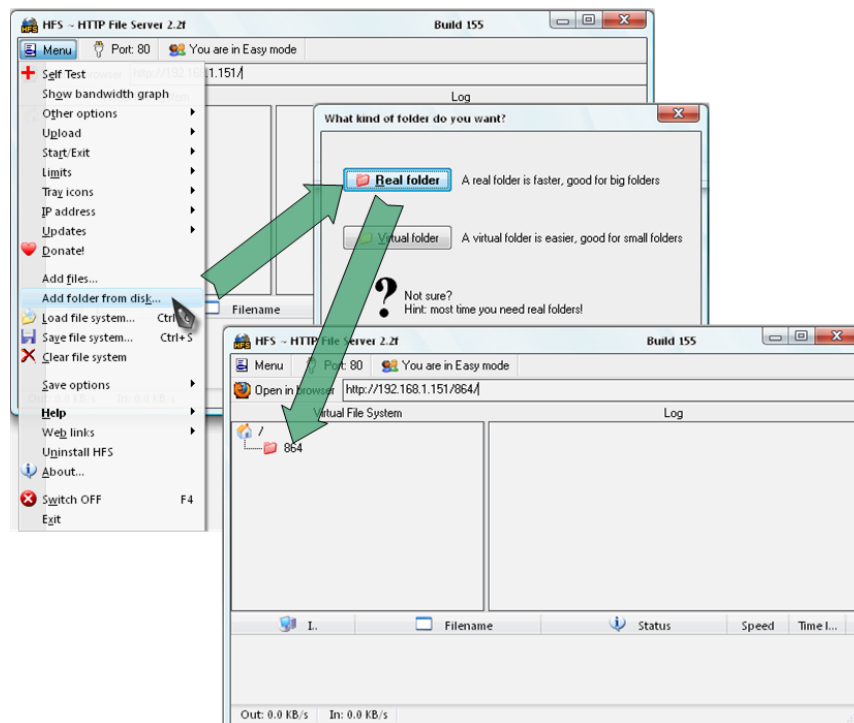
3. Once the firmware files are up on the HTTP file server, make sure that the files are accessible by using a browser and entering the host IP address followed by the firmware folder name.
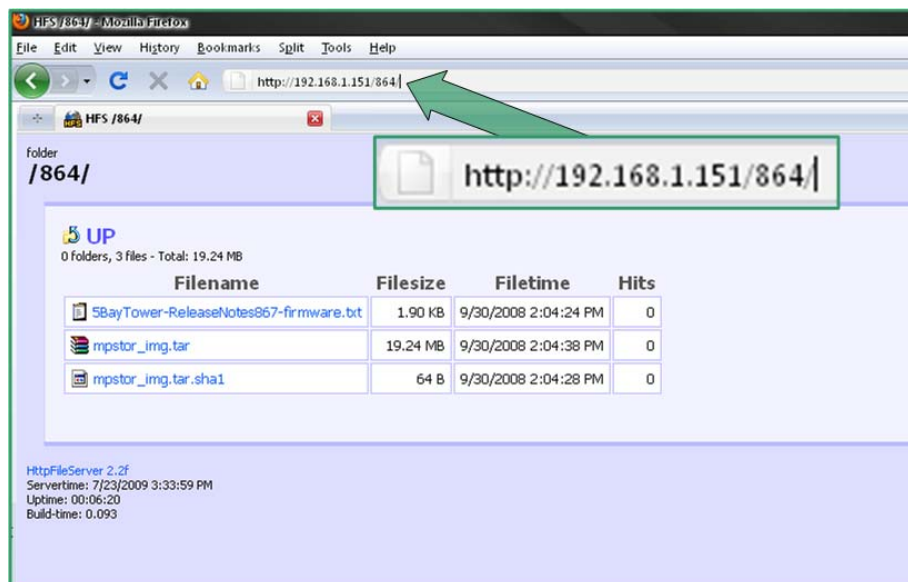
4. A connection between server and 3U16 RBOD must be established before proceed with the following steps:
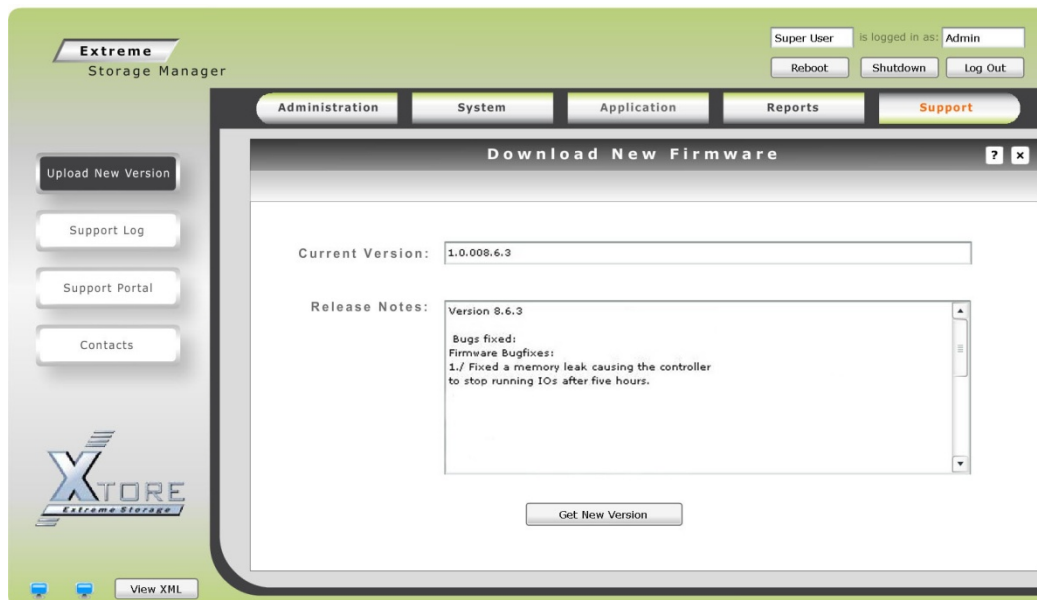
Under Support → Upload New Version, click on "Get New Version" button to start. This screen also shows the current version of the firmware.
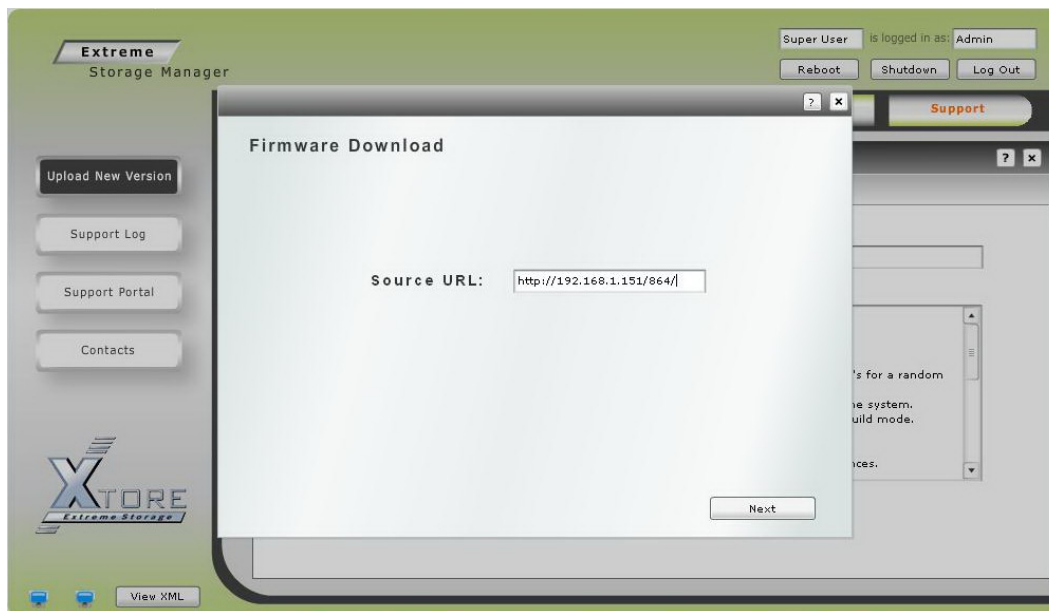
On the source URL, type in the IP address of the host followed by the folder where the firmware image resides. Click "Next" to proceed.
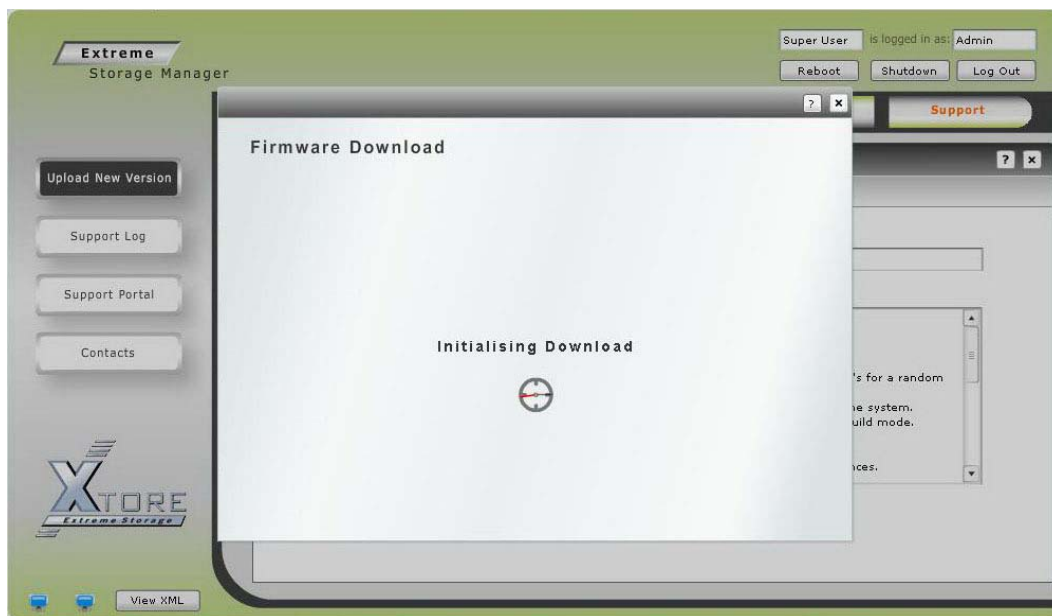
During firmware download, a window is seen as displayed above.

A progress bar shown during firmware installing.

After firmware is installed successfully, the above screen will appear showing the new firmware version as well as its release notes. Reboot the system afterwards.

4.7. GUI Session Management

The power maintenance functions are located on the top right corner of the GUI.

4.7.1. Reboot

To restart the RAID controller, press "Reboot" button. Allow a couple of minutes for the RAID controller to log out and restart itself.

4.7.2. Log Out
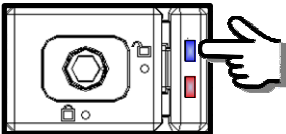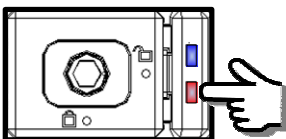
Press "Log Out" button to end the GUI session or login in as a different user.

4.7.3. Shutdown

The "Shutdown" button is available to turn off the RAID controller. Note that the enclosure power will not turn off by using this function. To shut down the system entirely, press the Power button of the enclosure as described in Chapter 3.1.4.

5. LED Status and Alert

The following table describes the LED status information and alerts.

Item	Description of Operation
Drive Tray Activity LED	Blue LED is located on the top Off – Drive not present or not powered on Solid Blue – Drive powered on, no activity Intermittent Blue – Drive powered on, activity
Drive Tray Error LED	Red Error LED is located at the bottom Off – No fault Red – Fault: check DSS GUI for detail
Fibre Channel LED	Red solid dim – standby power mode Green solid – FC connection established
PSU unit Power LED	Green solid – Power on good status Red solid – Power failure
Ethernet LAN Port LED 1GB/s 100MB/s	100Mb/s ACT/Link LED is located on the top while 1Gb/s ACT/Link is the LED on the bottom: • Off – No link or activity • Solid Amber - Link established • Blinking Amber – Activity detected

6.   Appendix - Serial Port Interface

The serial Port Interface allows user to visualize the 1U10 Status using a standard serial port.

Most terminal types will work correctly.

The serial connection should be set to

- 115200 Baud

- 8 Bits

- 1 Stop bits

- No H/W handshaking

To display the menu hit the <ESC> key at any time.

The menu shown in Figure 6.1 will be displayed.

```
========================================================
                 MAIN MENU (192.168.1.41)
========================================================


    1) Configuration
    2) Disks
    3) Raids
    4) Logical Volumes
    5) Enclosures
    6) Events


Please select an option: _
```

Figure 6. Main Menu

6.1.   Configuration

By choosing option number 1 from the main menu, the option displays the following selections (Figure 6.1):

```
Please select an option: 1


    1) System config
    2) IP config
    3) HTTP config
    4) Serial Port config
    5) SMTP config

    Q) Main Menu


Please select an option:
```

Figure 6.1. Configuration Submenu

6.1.1. System Configuration

This option number 1 of the submenu displays the following information:

- Uptime: the time duration the system has been up

- The name of the system

- Date setting

- Current state of the system

- System ID

- An option to edit the configuration (edit name and action)

6.1.2. IP Configuration

Option number 2 displays the following information:

- DNS server

- Default gateway

- Subnet mask

- DHCP setting

- IP address

- A selection to edit IP address, subnet mask and default gateway

6.1.3. HTTP Configuration

Option number 3 lists the following information:

- Username

- Proxy setting

- Host name

- Port number

- Password

- Choices to edit proxy setting, hostname, username, password and port

6.1.4. Serial Port Configuration

This configuration displays the current baud rate and a selection to edit the baud rate.

6.1.5. SMTP Configuration

This configuration option number 5 displays:

- SMTP username

- Authentication setting

- SMTP port

- Hostname and password

- The option to change host name, port, username, password and authentication setting

6.2. Disks

Choosing this second option from the main menu will present the user a list of all disks installed by selecting "View all disks" option from the submenu.

```
Please select an option: 2


   1) View all disks

   Q) Main Menu
```

Figure 6.2.1. Disks Submenu

Furthermore, selecting "View disk details" will show the detail of the drive selected as exampled below.

```
Please select the disk number you wish to view: 1

  1) View disk details

  B) Back to disk list

Please select an option: 1


          Disk 1316224 (1 of 1)
          --------------------
        enclosure_name : MPSTOR 3U 16 bay single density 0
       shuttle_position : Front
              raid_name : Raid 1
                   raid : 1053178
                ejected : 0
                   size : 698 GB
              raid_role : Used
               protocol : SATA
              enclosure : 1357576
                shuttle : 1052895
                  state : Online
          shuttle_index : 5
         status_summary : Good
          serial_number : WD-WCAPT0303094
                    qos : Mission Critical
                  model : WDC WD7500AYYS-0
                    wwn : 5766302626367115908
                     id : 1316224
           manufacturer : ATA
```

Figure 6.2.2. Disk Detailed View

6.3. RAIDs

Choosing the third option from the main menu will present the user a list of RAID built by selecting "View all raids" option from the submenu.

```
Please select an option: 3

    1) View all raids
    2) Add raid

    Q) Main Menu

Please select an option: _
```

Figure 6.3.1. RAID Submenu

Below is the detailed view of the selected RAID. See Figure 6.3.2. for example.

```
Please select an option: 1

                Raid 1053178 (1 of 1)
                --------------------
                     parity : Good
                        qos : Mission Critical
                         id : 1053178
                       size : 1397 GB
                 num_spares : 0
                       rows : 3
             caching_policy : Write Through
 estimated_build_completion : 26432115.0000
                      state : Online
                    columns : 1
            max_build_speed : 200
                 controller : 1357494
                 redundancy : 1
             build_progress : 0.0000
                  num_disks : 3
                 chunk_size : 64
                 read_ahead : False
                 used_space : 0
                       name : Raid 1
                      level : 2
                build_speed : 0.0000
             status_summary : Good
            parity_algorithm : Left Symmetric
           automatic_rebuild : False
```

Figure 6.3.2. RAID Detailed View

6.4. Logical Volume

The fourth option of the terminal console main menu manages logical volumes.

```
Please select an option: 4

    1) View all Logical Volumes
    2) Add Logical Volume

    Q) Main Menu
```

Figure 6.4.1. Logical Volumes Submenu

```
Please select an option: 1


     id        size    name              status_summary  access_policy  write_prot
ection   state


  1) 1817073  20 GB  Logical Volume 1  Good              Allow          False
        Online


  B) Back to Logical Volumes menu
```

```
Please select the logical volume number you wish to view: 1


  1) View logical volume details
  2) Start logical volume
  3) Stop logical volume
  4) Delete logical volume


  B) Back to logical volume list


Please select an option: _
```

Figure 6.4.2. Logical Volumes View

The above figure displays the logical volume created in Section 4.1.4. Selecting the logical volume will provide options to view the details, start, stop, and delete the logical volume. Below is the result of option number 1.


```
Please select an option: 1


            Logical Volume 1817073 (1 of 1)
            --------------------------------
                        name : Logical Volume 1
            write_protection : False
               access_policy : Allow
                  controller : 1562127
                 io_throttle : 0.5000
          bandwidth_throttle : 0.4000     |
                       state : Online
              status_summary : Good
          primary_controller : 1562127
                          id : 1817073
                         lun : 0
                        size : 20 GB
```

Figure 6.4.3. Logical Volumes Detailed View

6.5. Enclosure

The fifth option is to manage the enclosure.

```
Please select an option: 5


   1) Enclosure 1

   Q) Main Menu


Please select the enclosure number you wish to view: 1


   1) View Enclosure Map
   2) View Enclosure General Data
   3) View Enclosure Disk Data
   4) View Enclosure Power Module Data


   B) Back to enclosures list

   Q) Main Menu
```

Figure 6.5. Enclosure Submenu and Its Branches

6.5.1. Enclosure Map

By pressing key '1', this option displays the following information:

```
Please select an option: 1


+----------------+  +----------------+  +----------------+  +----------------+
|   3) Y/F/-/-   |  |   7) Y/F/-/-   |  |  11) Y/F/-/-   |  |  15) Y/F/-/-   |
+----------------+  +----------------+  +----------------+  +----------------+

+----------------+  +----------------+  +----------------+  +----------------+
|   2) Y/F/-/-   |  |   6) Y/F/-/-   |  |  10) Y/F/-/-   |  |  14) Y/U/-/-   |
+----------------+  +----------------+  +----------------+  +----------------+

+----------------+  +----------------+  +----------------+  +----------------+
|   1) Y/F/-/-   |  |   5) Y/U/-/-   |  |   9) Y/F/-/-   |  |  13) Y/F/-/-   |
+----------------+  +----------------+  +----------------+  +----------------+

+----------------+  +----------------+  +----------------+  +----------------+
|   0) Y/F/-/-   |  |   4) Y/F/-/-   |  |   8) Y/U/-/-   |  |  12) Y/F/-/-   |
+----------------+  +----------------+  +----------------+  +----------------+

Code format: [front_disk_state]/[front_disk_raid_role]/[back_disk_state]/[back_d
isk_raid_role]

Code key:

  Y - Disk online
  N - Disk offline
  U - Disk in use on raid
  D - Disk is dedicated spare
  G - Disk is global spare
  F - Disk free
```

Figure 6.5.1. Enclosure Map and Disk Status

6.5.2. Enclosure General Data

Pressing key '2', the option displays the enclosure information such as temperature status, PSU status, fan status, number of disk present. More information is attached below.

```
Please select an option: 2


              Enclosure 1357576 (1 of 1)
              --------------------------
        temperature_status : Fault
               psu_status : Fault
                 shelf_id : 0
             enclosure_type : MPSTOR 3u 16
             drive_status : Fault
      interface_board_0_type : Controller
               fan_status : Fault
             system_status : Fault
                num_disks : 16
      interface_board_1_type : Not Present
                      wwn : None
                       id : 1357576
                     name : MPSTOR 3U 16 bay single density 0
```

Figure 6.5.2. Enclosure General Data

This option allows the user to view what devices are installed in the system.

6.5.3. Enclosure Disk Data

This option will list all the installed disks in succession.

```
Please select an option: 3


                Disk 1316224 (1 of 16)
                ----------------------
         enclosure_name : MPSTOR 3U 16 bay single density 0
        shuttle_position : Front
              raid_name : Raid 1
                   raid : 1053178
                ejected : 0
                   size : 698 GB
              raid_role : Used
               protocol : SATA
              enclosure : 1357576
                shuttle : 1052895
                  state : Online
          shuttle_index : 5
         status_summary : Good
          serial_number : WD-WCAPT0303094
                    qos : Mission Critical
                  model : WDC WD7500AYYS-0
                    wwn : 5766302626367115908
                     id : 1316224
           manufacturer : ATA

                Disk 1208518 (2 of 16)
                ----------------------
         enclosure_name : MPSTOR 3U 16 bay single density 0
        shuttle_position : Front
              raid_name : Raid 1
                   raid : 1053178
                ejected : 0
                   size : 698 GB
              raid_role : Used
```

Figure 6.5.3. Enclosure Disk Data

6.5.4. Enclosure Power Module Data

This option displays the following information about the corresponding PSU.

```
Please select an option: 4

        Power Module 1052888 (1 of 2)
        -----------------------------
              dc_state : Good
              ac_state : Good
           temperature : -20
             fan_state : Faulty
         current_level : 10.6400
 temperature_probe_state : Faulty
             fan_speed : 0
                    id : 1052888
                 state : Not Present
         voltage_level : 12.1000
        status_summary : Warning
        location_index : 0
             enclosure : 1357576


        Power Module 1052889 (2 of 2)
        -----------------------------
              dc_state : Good
              ac_state : Good
           temperature : -20
             fan_state : Faulty
         current_level : 10.7600
 temperature_probe_state : Faulty
             fan_speed : 0
                    id : 1052889
                 state : Not Present
         voltage_level : 12.1000
        status_summary : Warning
        location_index : 1
             enclosure : 1357576
```

Figure 6.5.4. Enclosure Power Module Data

6.6. Events

Choose option 1 to view all events, option 2 to filter events (shown in Figure 6.6.2.)

```
Please select an option: 6


   1) View all events
   2) Filter events

   Q) Main Menu
```

6.6.1. Events Submenu

```
Please select an option: 2

 1) Filter by event_id
 2) Filter by timestamp
 3) Filter by id
 4) Filter by action
 5) Filter by element_type
 6) Filter by path
 7) Filter by message
 8) Filter by user_name
 9) Filter by element_id
10) Filter by element_name


 B) Back
```

6.6.2. Filter Events Menu

7.   Glossary

Mezzanine Card
A circuit board meant to be an extension or "daughter" of a motherboard or main board.

1U/2U
A "U", Rack Unit, is equal to 1.75" in height. One rack unit is commonly designated as "1U"; similarly, 2 rack units are "2U" and so on.

HDD
A hard disk drive (HDD) commonly referred to as a hard drive or hard disk.

Hot Swap
The ability to pull out a component from a system and plug in a new one while the power is still on and the unit is still operating. Redundant systems can be designed to swap drives, circuit boards, power supplies and virtually anything that is duplicated within the system.

Redundant
It is used to guard the primary system from failure by acting as a backup system.

Host Bus Adapter (HBA)
An I/O adapter that sits between the host computer's bus and the storage device and manages the transfer of information between the two devices

If you have any technical questions, please contact your authorized dealer before contacting us.

For more information, visit www.aicipc.com